1943

May the New Year bring the blessings of Victory to all true Americans and freedom-loving people throughout the world.

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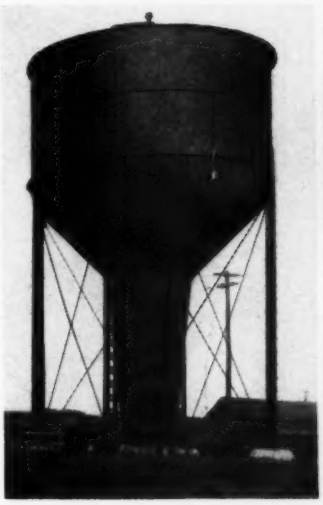
ONLY 1 OUT OF 4 LEFT TO FIGHT CORROSION

Many railroad men have enlisted in the service . . . others have been taken off maintenance work for operating jobs. But maintenance must go on, and especially rust control. Bridges have to be protected against corrosion . . . turntables, too . . . in fact, all metal structures have to be protected. Fortunately, you can stretch your maintenance work farther with fewer men if you use NO-OX-ID.

NO-OX-ID RUST PREVENTIVE HELPS BECAUSE TIME-CONSUMING PRE-CLEANING IS UNNECESSARY



Steel tanks treated internally and externally with NO-OX-ID last many years longer.

Stop the loss of steel due to corrosion by treating your bridges with NO-OX-ID. Applied easily.

Top—Turntables when treated with NO-OX-ID resist the most severe conditions.

Bottom—Rail joints when treated with NO-OX-ID resist corrosion from numerous causes.

DEARBORN CHEMICAL COMPANY
Dept. U, 310 S. Michigan Ave., Chicago
NEW YORK • LOS ANGELES • TORONTO

"THE LEADER FOR 25 YEARS"
NO-OX-ID
IRON, OX, RUST
rust preventive

Escort FOR SAFETY

. . . Seldom seen and virtually unknown to the casual rider . . . yet ranked by railroad men as a vital factor in the safe, swift and certain operation of the system.

Today, as never before, the safety and dependability of rail transportation rests upon the efficient maintenance of roadbed equipment. To this end, Fairmont shoulders the responsibility of providing motor cars for every branch of inspection and maintenance work . . . cars scientifically designed, constructed and powered for hard year-in-year-out dependable performance.

As a result of 33 years of specialized service to this field, Fairmont motor cars embody many exclusive features that mark them as outstanding leaders . . . in efficient and economical operation, in the safety and comfort of manpower, and in the conservation of time and energy . . . explanation enough of the fact that *more than half the cars in service today are Fairmonts.*

Fairmont

RAILWAY MOTOR CAR

Performance
ON THE JOB COUNTS

Two men easily handle this Standard Section Car, S2 Series F, yet it seats 8 men and hauls 2 loaded trailers.

OF ALL THE CARS IN SERVICE TODAY . . *MORE THAN HALF ARE FAIRMONTS*

GET THE MOST OUT OF EVERY ELECTRODE

Burn them down to a 2" stub

By burning every electrode down to a 2" stub you can save up to 5 lbs. of electrodes from every 50 lb. box. This is one important way that good welding operators are helping to meet the electrode shortage. Some other important rules to follow are:

1. Choose the proper welding current for the size of electrode being used. Excessive welding current may break down the coating before the electrode is consumed.

2. Select largest diameter electrodes to get faster deposition of metal. Using an 18" length instead of 14" reduces the number of times it is necessary to change an electrode for a given length of weld. This increases welding speed 25-30% and saves 3-4% stub loss.

3. Make legs of fillet welds equal and make face of fillet welds flat. Convexity of fillet weld faces should never exceed 10%.

Follow these suggestions to get the maximum work out of every electrode. In this way you can help prevent waste of the vital materials that are helping the railroads perform their essential wartime job.

Air Reduction

General Offices: **60 EAST 42nd ST., NEW YORK, N. Y.**

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MAGNOLIA-AIRCO GAS PRODUCTS CO.

General Offices: **HOUSTON, TEXAS**

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AIRCO

WILSON

IDLE CYLINDERS ARE PRODUCTION SLACKERS: *Keep 'em rolling for victory!*

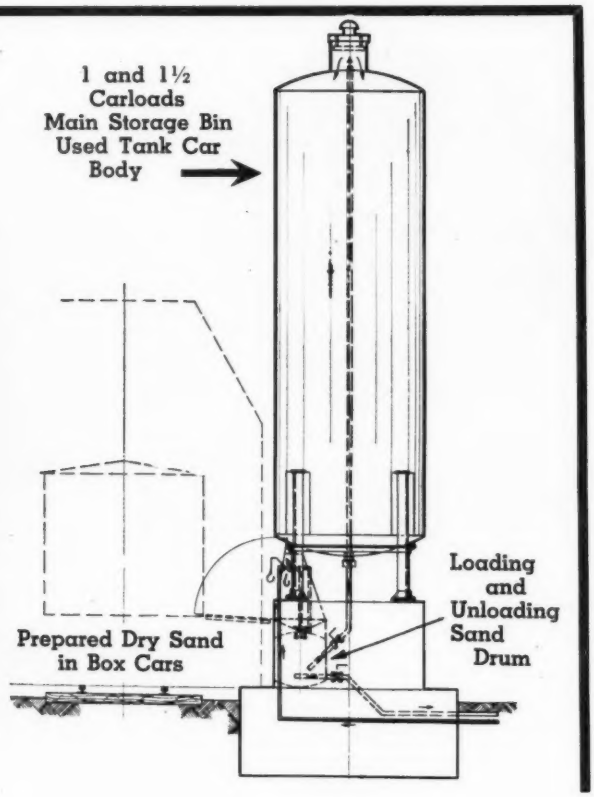
VICTORY
Sand Plants

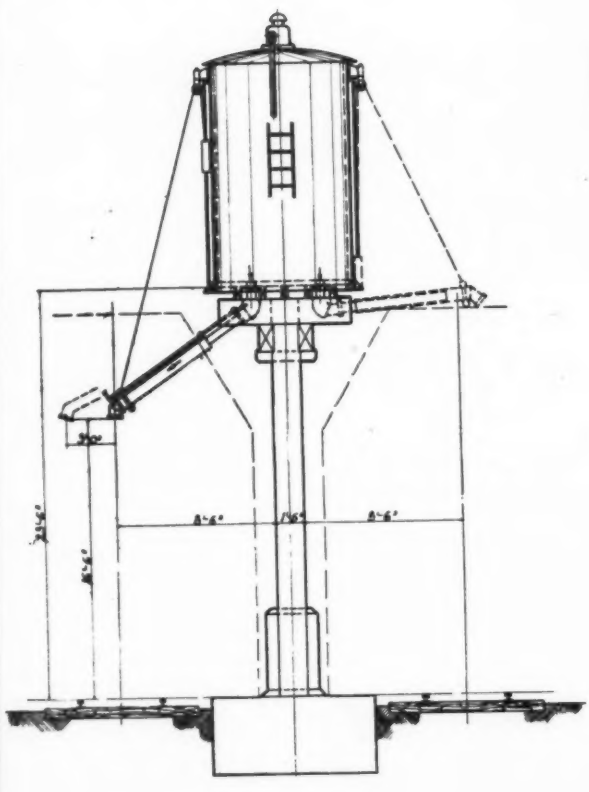
Absolute Minimum New Steel Required

Sand Spouts.....from Old Flues
Sand Delivery Tank...Wood Construction
Sand Storage Tanks.....Used Material

MODERN DESIGN

Minimum Hand Labor to Operate Steam, Diesel and Electric Locomotives





SNOWCO
5″ Sand Spout Wood Sand Tanks

5-10-15-20 Yd.

Wood Towers—Conc. Foundations

SNOWCO Sand Stoves

SNOWCO Sand Lift Drums

Minimum Critical Material

T. W. SNOW CONSTRUCTION CO.

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A PIONEER THEN—

A LEADER TODAY

WE are celebrating with pride and thankfulness this year our Seventieth Anniversary—with pride for the privilege of serving the Nation and the Railroads — with thankfulness for the generous response that has come to our efforts.

As modern as tomorrow, but with the knowledge and experience of nearly a century, Woodings-Verona Tool Works specializes in the manufacture of Spring Devices and Track Tools which are safeguarding and protecting thousands of miles of tracks on railroads all over the Nation.

At this milepost in our history we pause only long enough to express our thanks to the Railroads for their continued confidence and appreciation of our efforts. And, we embrace this opportunity to offer the assurance that in the future as in the past we will strive to serve not only well, but better and better with each succeeding day.

WOODINGS-VERONA TOOL WORKS
WOODINGS FORGE and TOOL COMPANY

VERONA, PA.

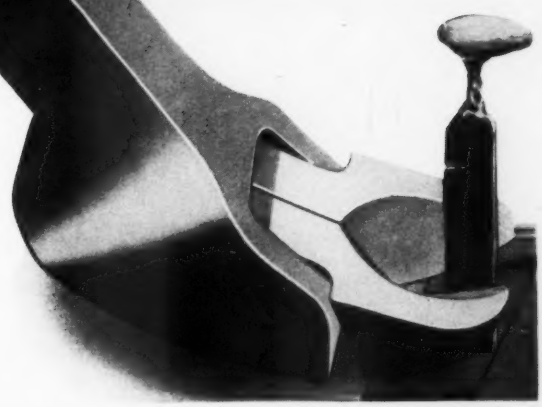
Flex-Toe Claw Bars Save Lots of Time

Throw the bar on the spike in the usual way. No driving necessary.

Tips of the toes grab hold automatically as leverage is applied to the handle.

Flex-Toe holds onto the body of the spike and removes the spike WITHOUT SPIKE MAUL DRIVING.

Remove spikes straight out by taking a series of holds along the body of the spike—a ratchet action.



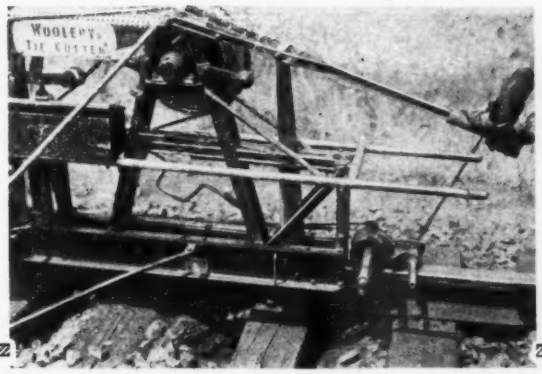
FLEX-TOE Pulls all of them . . .

● When it comes to removing downright hard-to-get spikes, drift bolts, and boat spikes, it takes Flex-Toe Claw Bars. But, Flex-Toe Bars are not only good for the headless and throat-cut varieties . . . they get the ordinary kind easier and faster—even when located in difficult places such as rail-joints, etc. With these modern bars, two men are able to pull as many spikes as three men can with ordinary bars. Furthermore, ALL the spikes come out WITHOUT SPIKE MAUL DRIVING—ties are saved. There's nothing new to learn and inexperienced hands, as well as old timers, can use Flex-Toes with far greater safety. And in addition, Flex-Toe Bars stand the gaff.

WARREN TOOL CORP. · WARREN, OHIO

MANUFACTURED BY MAKERS OF THE FAMOUS DEVIL LINE OF TRACK TOOLS

WE'RE IN WAR



Hurry Up Those TIE RENEWALS

SAVE Manhours and Manpower with WOOLERY TIE CUTTERS

WOOLERY TIE CUTTERS
Get the Ties Out in a Jiffy— In Stone, Gravel, or Other Ballast!

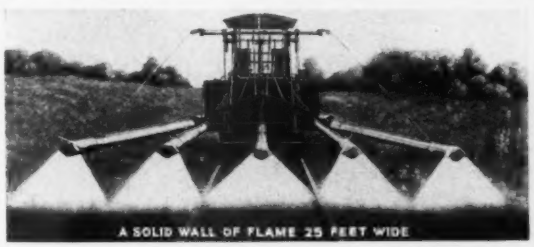
During 1942 many Railroads found it possible to do the impossible in a hurry in renewing ties with the aid of Woolery Tie Cutters.

For the worker uses the Woolery Tie Cutter simply to saw the tie inside each rail and the three pieces are easily lifted (not dug) out, without disturbing the tie-bed.

Woolery Tie Cutters eliminate the laborious digging out of the crib beside the tie, jacking up the track and then pulling and hauling the tie—wasting the time and energy of two or three workers. In the Woolery way new ties are inserted with a minimum of time, labor and tamping. That is why the Woolery Tie Cutter pays for itself twice over in a single season.

Ask for a Free Demonstration

to Convince Yourself that You can Save a Third of Your Usual Tie Renewal Labor Time and Costs in 1943, with the WOOLERY TIE CUTTER.



Above: 5-burner Giant Octopus Model; 3- and 2-burner Models also available.

Insure Clear Track in '43 with WOOLERY WEED BURNERS

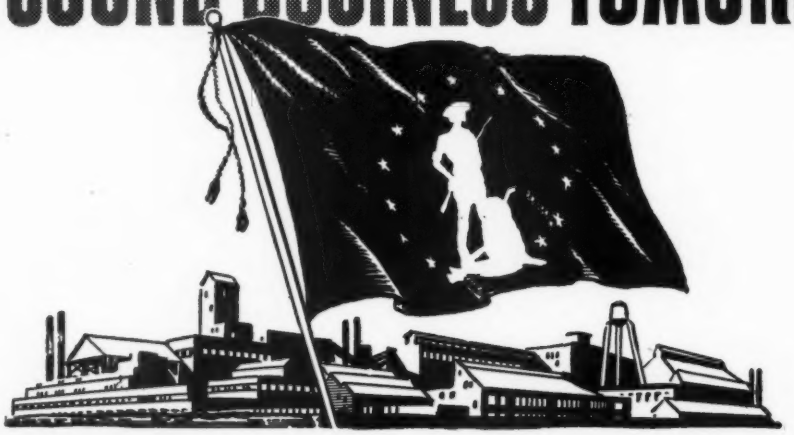
Woolery Weed Burners do fast, thorough, economical track cleaning—proved by the fact that they are now employed by more than 60 railroads.

Select the Woolery Models that best fulfill your requirements. Woolery Giant Octopus with 3 or 5 burners for main line track; Midget 2-burner and Woolery Junior 1-burner for branch line and yard tracks.

Woolery Junior Weed Burner

WOOLERY MACHINE CO. MINNEAPOLIS MINNESOTA

FOR VICTORY TODAY AND SOUND BUSINESS TOMORROW



Get This Flag Flying Now!

This War Savings Flag which flies today over companies, large and small, all across the land means *business.* It means, first, that 10% of the company's gross pay roll is being invested in War Bonds by the workers voluntarily.

It also means that the employees of all these companies are doing their part for Victory . . . by helping to buy the guns, tanks, and planes that America and her allies *must* have to win.

It means that billions of dollars are being diverted from "bidding" for the constantly shrinking stock of goods available, thus putting a brake on inflation. And it means that billions of dollars will be held in readiness for post-war readjustment.

Think what 10% of the national income, saved in War Bonds now, month after month, can buy when the war ends!

For Victory today . . . and prosperity *tomorrow,* keep the War Bond Pay-roll Savings Plan rolling in *your* firm. Get that flag flying now! Your State War Savings Staff Administrator will gladly explain how you may do so.

If your firm has not already installed the Payroll Savings Plan, *now is the time to do so.* For full details, plus samples of result-getting literature and promotional helps, write or wire: War Savings Staff, Section F, Treasury Department, 709 Twelfth Street NW., Washington, D. C.

EVERYBODY EVERY PAYDAY AT LEAST 10%

Save With

War Savings Bonds

This Space Is a Contribution to America's All-Out War Program by

RAILWAY ENGINEERING AND MAINTENANCE

No. 169 of a series

Railway
Engineering and Maintenance
SIMMONS-BOARDMAN PUBLISHING CORPORATION

Subject: Rising Costs

105 WEST ADAMS ST.
CHICAGO, ILL.

January 1, 1943

Dear Reader:

In these days when the cost of almost everything that we buy is rising so rapidly, I wonder if you have noticed that there is one cost that has not risen. I refer to your subscription to Railway Engineering and Maintenance, the cost of which still remains at $2 for one year and $3 for two years. In maintaining this rate, we are running counter to the general trend of prices; we are also departing from the precedent set by many leading magazines such as the Saturday Evening Post and Collier's which raised their subscription rates earlier in the year.

And we are not immune to increased costs of operation for, like the railroads, almost everything we buy is rising. Paper now costs 5 per cent more than 15 months ago. We increased our payments to our printer 4 per cent a couple months ago to reimburse him for increases in his labor, ink, and other materials and this increase follows an earlier increase of 7 per cent that was effective a year ago. Clerical wages are rising rapidly – a few weeks ago one of our 17 year old office boys left a $20 a week job running errands for us to take a $28 a week job in a defense plant. And not the least is the increase in travel costs brought about by the raise in passenger fares that became effective on February 10, 1942, and the 10 per cent tax that is now added thereto. All these add appreciably to our cost of producing the paper which you receive from month to month.

We are absorbing these costs and maintaining our subscription price at the old level at a time when the many letters that we are constantly receiving from you demonstrate that you are finding Railway Engineering and Maintenance even more valuable to you in these days when changing conditions force revisions in practices, when priorities force substitutions in materials and when the experiences of others are far more helpful to you than in the more stable days. As we travel among you, we note your more intensive use of our magazine. More of you are carrying it out on the line with you. We never see it in the wrappers, but always opened and showing evidence of use.

All of this leads me to offer two suggestions - the first is that, where you share your copy with others, you arrange to secure your own individual copy in order that you may read and use it when you desire and in the way that will be most helpful to you. The second suggestion, to those of you who serve as supervisors, is that you not only arrange to receive your own personal copy, but that you enter one or two additional subscriptions also to provide copies to pass among your foremen to stimulate their interest in and knowledge of their work. A still better practice is, of course, to arrange for each foreman to receive his own copy, by the supervisor arranging for the men to enter subscriptions themselves through our local agency plan, which I will be glad to tell you more about, if you desire.

Yours sincerely,

Elmer T. Howson

ETH:WB

Editor

MEMBERS: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.

Flame-straightening of worn joint bars is done by heating an area on the base of each bar by means of oxy-acetylene flames. The subsequent cooling action raises the center of the bar to a full contact at the fishing surfaces. Through this action, flame-straightening releases the rail ends so that they assume their true surface. Practically the full strength of the joint bar is retained.

OXY-ACETYLENE FLAME-STRAIGHTENING

Saves Steel and Reduces Wear in Equipment

• Oxy-acetylene flame-straightening is being used with excellent results to overcome the sag or "droop" that worn joint bars cause at the rail joints. This procedure not only saves steel, because it prolongs the useful life of joint bars now in track, but also—because it restores rail to a more nearly true surface—greatly reduces wear and tear on locomotives and cars. In addition, when used in connection with a program of building up rail ends by welding, flame-straightening materially reduces the amount of welding—and welding rod—required.

Oxy-acetylene flame-straightening of joint bars was developed many years ago by a leading railroad with the co-operation of Oxweld Railroad Service. The experience of this railroad, and other roads that have adopted flame-straightening—as well as our continuing laboratory investigations into the metallurgical aspects of this development—have provided the data which has enabled the Oxweld organization to establish standard procedures for the method.

Oxweld Railroad Service is thus able to help the railroads use oxy-acetylene flame-straightening most effectively.

THE OXWELD RAILROAD SERVICE COMPANY

Unit of Union Carbide and Carbon Corporation

UCC

Carbide and Carbon Building — Chicago and New York

SINCE 1912—THE COMPLETE OXY-ACETYLENE SERVICE FOR AMERICAN RAILROADS

NORDBERG POWER TRACK TOOLS

Help Solve the Manpower Problem

The Nordberg Hydraulic Power Jack is typical of the labor saving possibilities of Nordberg tools. The operator replaces eight to twelve men that would have been required if hand jacks were used.

One Adzing Machine easily replaces six to ten men working with hand adzes. The machine finished seats for new rail are so far superior to hand prepared seats that there is no comparison in quality.

With the growing shortage of labor and with the increased track maintenance required to meet wartime traffic, the use of Nordberg power tools is more essential now than ever before. These machines were developed to save labor and do a better job of track maintenance. Nordberg power tools on the job will help you in your maintenance program in face of today's scarcity of labor. Work will be speeded up. Traffic delays due to maintenance work being done on track will be avoided. If you are not making full use of the facilities of Nordberg tools, investigate their possibilities.

DO YOUR TRACK WORK WITH THESE LABOR AND TIME SAVING TOOLS

Power Jack	Adzing Machine
Spike Puller	Rail Drill
Track Wrench	Track Shifter

Five Rail Grinders

We are proud to fly the Navy "E" with the added star signifying that excellence in production has been maintained.

NORDBERG MACHINERY

NORDBERG MFG. CO. MILWAUKEE WISCONSIN

Export Representative—WONHAM Inc.—44 Whitehall St., New York

Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

JANUARY, 1943

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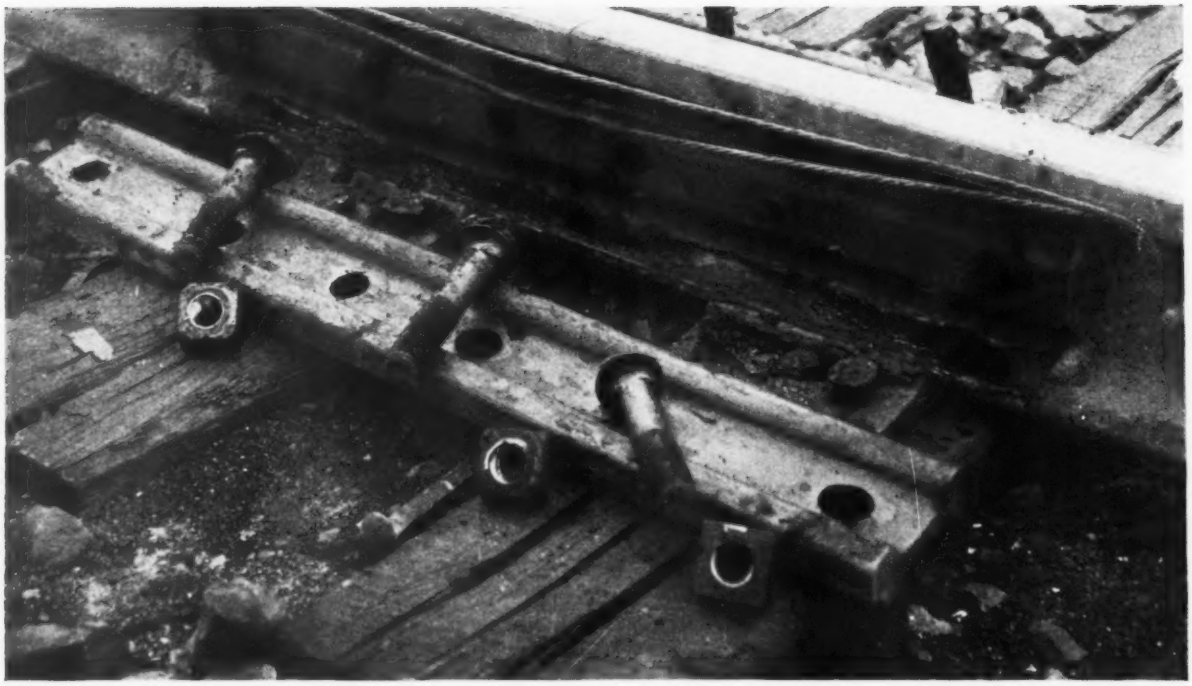


4 years after packing with RMC PLASTIC, joint assemblies are still 100% Corrosion-free!

R M C Plastic Prevents Corrosion

LUBRICATES - - PROTECTS RAIL JOINTS

The cumulative values of men and vital materials created by war conditions make yesterday's **necessary** precautions **urgent** today.

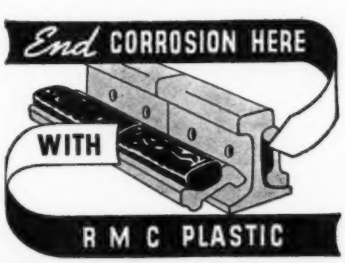
RMC PLASTIC is proving itself a permanent, definite means of preventing corrosion in the rail joint area, saving thousands of tons of rail steel annually, providing better, smoother-riding track and reducing greatly the need of frequent inspections, permitting labor to be diverted to other important tasks.

One application of RMC Plastic provides **complete,** permanent protection for rail joints against all corrosion and kinked track. RMC Plastic also lubricates the joints so thoroughly that the rails cannot "freeze" when bolts are properly tensioned, but are free to expand and contract uniformly.

RMC Plastic is simply applied: 1. Moulded blocks of Plastic are placed on joint bars; 2. Joint bars are applied in the conventional manner; 3. Joint bars are bolted to rail and as bolts are tightened, the pressure squeezes the preservative into contact with all points in the splice.

NO HIGH PRIORITIES ON RMC PLASTIC

You Can Get All You Want When You Want It!



RAILWAY MAINTENANCE CORP.

PITTSBURGH, PENNSYLVANIA

Railway Engineering and Maintenance

High Lights for 1942

Railways Break All-Time Records

The year 1942 was characterized by all-out conversion for war. Nowhere was this more marked than on the railways. In no previous war have our armed forces been so dependent on transportation. And in no previous year have the railways produced so much transportation. Despite the rapidity with which these demands grew, the railways handled more than 80 per cent of the increase in freight and nearly 80 per cent of the increase in passenger traffic, demonstrating the nation's dependence on its railways.

Among the measures of this achievement of 1942 are the following, compiled largely by Dr. Julius Parmelee, director of the Bureau of Railway Economics, Association of American Railroads.

The traffic handled by the railways reached an all-time high. Freight traffic (in ton miles) exceeded that for 1941 by 32.6 per cent; it surpassed that of the previous record year of 1929 by 41.0 per cent and was 55.4 per cent greater than in the war year of 1918. Passenger traffic (in passenger miles) increased 80.6 per cent over 1941; it exceeded that of the highest previous year, 1920, by 13.1 per cent and was 24.2 per cent larger than in 1918.

Operating revenues (for the 12 months ending October 31, 1942) totaled $7,010,000,000. They rose from $5,347,000,000 in the calendar year 1941 and compare with slightly more than 6¼ billion dollars in the previous record year of 1929.

Railway taxes (for the year ending October 31, 1942) totaled $1,076,000,000; they were $547,230,000 in the year 1941. They took 15.4 cents of each dollar of revenues, as compared with 10.2 cents in 1941.

Net railway operating income (for the 12 months ending October 31, 1942) totaled $1,309,235,000, an increase of 31 per cent over 1941, and yielding a return on investment of 4.92 per cent, the first year in which this rate has exceeded 4 per cent since 1929.

Operating Indices

Equally outstanding were the indices of operating efficiency, as shown by figures for the first ten months of 1942.

The average mileage per active freight locomotive (excluding unserviceable and stored units) per day reached a new high of 122.5. This compares with 116.4 miles per day in the year 1941.

The average mileage per active freight car per day established another high record at 50.6 miles, as contrasted with 45.7 miles in 1941.

The average load per freight car was 31.5 net tons, 3.0 tons more than in the previous record year of 1941.

The average load per freight train was 1,030 net tons, 115 tons more than the previous record in 1941. It compares with 663 tons in 1932.

Gross ton-miles per freight train hour exceeded all previous records for the tenth consecutive year. The 1942 figure of 35,874 compares with 34,684 gross ton miles in 1941 and 22,046 in 1932.

Only in the average speed of freight trains did the railways fail to attain a new record. The figure of 15.9 miles compares with 16.5 miles in 1941 and reflects the effects of the increasing density of traffic.

These figures reveal the outstanding contribution that the railways made to the nation's war effort and to civilian needs during 1942. They demonstrate that railway employees are determined that "there shall be no bottlenecks on the railways".

The Year 1942

In Engineering and Maintenance

Equally as outstanding as the records made by the railways as a whole in meeting the transportation needs of the country in 1942 were the achievements of engineering and maintenance of way forces in providing the roadway and structures over which this traffic could be moved expeditiously and safely. Never was the versatility of these forces demonstrated more strikingly, for they faced new conditions at every turn—all striking reversals of more than ten years of sub-normal depression levels. The manner in which these new conditions were taken "in their stride" by engineering and maintenance of way forces, reflects great credit on their resourcefulness and ability. It will long remain a high record of achievement.

Construction

In construction, the expenditures exceeded those for any year since 1931. Contrary to the practice of a quarter century ago when activities of this character were measured by the mileage of new lines and of multiple main tracks built, the index now is the magnitude of the expenditures made for the improvement, enlargement and modernization of existing facilities. Thus in 1942 only 74 miles of new lines were built (as compared with 54 miles in 1941 and 26 miles in 1940, an average of 2884 miles annually during the 20 years ending with 1921 and 13,081 miles in the record year of 1887).

However, prompted by the necessity for eliminating bottlenecks in capacity and by the availability of the money required for improvements, it is estimated that the railways spent in excess of $250,000,000 in 1942 for improvements to roadway and structures, chargeable to capital account, as compared with $175,450,000 in 1941. This greatly increased outlay went for improvements falling in two main groups, (a) those necessary to provide the capacity for handling the sudden increase in traffic, including additional passing tracks (the Southern Pacific extended 85 passing tracks in 1942), longer turntables to accommodate larger locomotives, centralized traffic control, larger water stations, etc., and (b) those projects long desired but deferred from year to year because of lack of funds, including the strengthening of bridges, the reconstruction of locomotive terminals and the modernization of many other facilities. All in all, the railways made marked progress during the year in clearing up the vast backlog of improvement work that accumulated during the "thirties."

A type of construction that appeared first in 1940 and that took on the form of a major activity in 1942 was the construction of tracks to serve war industries, training camps and ordnance depots. This work involved the construction of some 8000 miles of tracks in 1942, in addition to approximately 1250 miles of such tracks built prior to last year. While this work is not yet completed, it may be expected to draw to an early close.

Abandonments

As a form of construction in reverse, railway abandonments established a new high record in 1942, when operation ceased on 2,516 miles of lines. This was 1,007 miles more than were abandoned in 1941 and 521 miles more than in the previous record year of 1934. It brought the mileage of lines abandoned during the 26 years beginning with 1917 to 29,237 during which period only 10,684 miles of new lines were built, resulting in a net decrease of 18,553 miles of lines.

The efforts of the railways to divest themselves of unproductive mileage was given great impetus last year by the demands of war agencies for rails, which caused these agencies to appear in support of railway petitions for abandonments in numerous instances and to initiate these measures through condemnation actions in others. Through these and other channels, the railways accumulated and turned more than 60,000,000 lineal feet (nearly 6,000 track miles) of used rails over to government agencies during the year, a truly remarkable feat and one that won high commendation from federal officers.

Maintenance Expenditures

Even more striking is the record of expenditures which the railways made for the current maintenance of their roadway and structures. Coincident with the increased wear and tear resulting from the greater use of the heavier traffic, these expenditures have increased every month, as compared with the same month of the preceding year, during the last two years until the total of approximately $790,000,000 for the year 1942 exceeds that for any year since 1929. This increase of nearly $200,000,000 or 31 per cent, in the year 1942 indicates the magnitude of the program that faced maintenance forces last year. And the crest of this program does not yet appear to have been reached for the expenditures in October, the latest month for which figures are available, were 21 per cent larger than in the corresponding month of 1941.

Maintenance Expenditures 1917-1942

1917	$ 442,108,862	1930	$705,470,940
1918	649,794,953	1931	530,612,890
1919	772,186,045	1932	351,179,041
1920	1,032,540,381	1933	322,335,022
1921	756,413,690	1934	365,285,353
1922	728,663,534	1935	393,642,261
1923	813,688,760	1936	454,842,407
1924	792,678,023	1937	495,593,913
1925	816,443,205	1938	420,147,125
1926	866,819,365	1939	466,830,844
1927	868,581,432	1940	497,031,272
1928	837,905,747	1941	603,088,381
1929	855,354,867	1942	790,000,000*

*Last two months estimated.

The expenditure of such large sums for the upkeep of the fixed properties might naturally lead to the conclusion that they point to a vast improvement in the condition of these properties. That improvement exists in some respects is evident. However, it should not be overlooked that these expenditures are being made at a time when traffic, and its corresponding wear and tear, are exceeding all previous experience and that, as a result, greater than normal expenditures are required for the replacement of service life extracted by this extraordinary use. When recognition is given also to the large amount of deferred maintenance that accumulated during the decade of sub-normal expenditures of the thirties, it is evident that the railways as a whole still have a long way to go before the fixed properties will attain the condition that prevailed in 1926-29 and that stood them in such good stead during the lean years that followed.

Another condition that has confronted maintenance officers this year is the inadequacy of many facilities that has been revealed by the heavier traffic. This has been true of many water stations (in both pumping and storage facilities), of industry, interchange, and house tracks, and of a wide variety of other facilities. It is true also of numerous branch lines which the establishment of war industries has suddenly elevated to main-line status. Such changes have thrust large additional and, in some cases, unexpected burdens on maintenance forces.

Another factor that was reflected in this year's expenditures for maintenance was the unbalanced nature of many of the programs. Confronted with inability to secure many of the "critical" materials they normally use, maintenance forces were forced to resort to substitute materials; even more largely, they found it necessary to revise their programs, postponing projects for which materials could not be secured and undertaking in lieu thereof extra amounts of other necessary work for which little or no critical materials are required. As a result, the roads have done more ballasting, ditching and building repair than would normally be anticipated, thereby getting such work done while awaiting the time when they can secure the materials which are not now available.

Rail

Especially acute is the situation with respect to rail. It is the railways' No. 1 problem in materials. In 1941, the railways laid 1,197,593 tons of rails in renewals. They requested 1,632,000 net tons of new rails for placement in 1942; they received 1,200,000 net tons. As a result, they fell short of making good the current wear and tear by at least a half million tons and added to this extent to the accumulated deficiency in rail renewals that we estimated a year ago as then totaling some 3,000,000 tons, or two full years renewals. That the continuation of such a trend can end only in disaster is evidenced by the increasing number of derailments resulting from failed rails in recent months.

Rail Applied in Renewals—Class I Roads

	Gross Tons		Gross Tons
1925	1,950,146	1934	631,093
1926	2,209,873	1935	582,794
1927	2,124,765	1936	921,298
1928	2,080,277	1937	1,029,861
1929	1,958,489	1938	599,752
1930	1,517,002	1939	878,643
1931	984,900	1940	998,914
1932	394,536	1941	1,197,593
1933	403,254	1942	1,210,000*

*Estimated

Evidence that the railways are alert to this danger is the fact that they have fixed their rail requirements for 1943 at 2,087,000 net tons and have so advised the War Production Board. It is heartening that the WPB has authorized the production of 480,000 net tons of rails during the first quarter of 1942, a rate which, if maintained throughout the year, will provide 1,920,000 tons.

Ties

The second index of the adequacy of roadway maintenance is afforded by cross-ties. Here the situation is almost equally as acute as with rail. In 1942, the railways installed approximately 49,000,000 crossties in renewals. This was approximately 1,750,000 more than in 1941 and was more than in any year since 1931. However, it was less than 15 per cent more than were installed annually during the depression years 1932-1940 inclusive when the destructive effects of traffic were far less proportionately. As a result, the deficiency in renewals of crossties necessary to restore the tracks to the condition existing in 1929, which we estimated a year ago to total at least 90,000,000 ties, or two full years' renewals at the rates of recent years, still exists and has been increased in 1942.

Looking to the future, the outlook for crossties is disconcerting, if not alarming. In general the roads have a large part of their 1943 requirements on hand, although a number of them drew on these supplies late in 1942 to meet increasing demands. The problem arises in the replenishment of these stocks and in bringing onto the seasoning yards now the ties that will be required in 1944. These latter ties should now be coming out of the woods in large numbers; yet in those areas ordinarily of largest production, less than 35 per cent of the normal supply is now coming from the woods.

Labor

Still another problem confronting maintenance officers, and one that bids fair to overshadow all others and become the Number 1 problem in 1943 is that of labor supply. The loss of large numbers of maintenance men into our armed services and even more into defense industries, has taken place at a time when the railways themselves needed greatly increased forces for their enlarged maintenance programs. This situation became more acute as the 1942 working season advanced, until a survey made by the Association of American Railroads as of September 15 showed a shortage of 59,416 workers on that date, of which 35,125 or nearly 60 per cent, were in the maintenance of way department. This problem is particularly acute on the Pacific Coast, where the two largest roads are currently short 4,500 and 1,500 maintenance of way men on their lines in this area alone.

Closely akin to the supply of labor is the increasing use made of work equipment. Here the picture is brighter and more reassuring. Following the record established in 1941 when the railways spent some $10,500,000 for 8,007 units of work equipment, they approached the same level last year when, as reported in detail in the leading article in this issue, the roads spent $10,270,000 for 7,612 more units of work equipment. By this means they will not only make the work more attractive to the men who are available but will also enable the maintenance forces to complete a larger part of their season's programs than would otherwise be possible.

While some anticipate that further work equipment units will be increasingly difficult to secure in 1943 owing to the growing scarcity of critical materials, others are relying on the versatility that the builders of this equipment have long displayed to maintain its flow, even though modified in details to meet the present exigencies. It is to be expected also that the trend towards increasing the working hours for such equipment, through a longer season, longer daily working periods, double crewing and more careful programming to avoid delays, which developed during the last year, will be carried to still greater lengths in 1943.

What of 1943?

The year that has just closed has been an exacting one for maintenance of way forces, with its record traffic, its shortages of critical materials and of labor. But it has been a year of accomplishment because, in the face of inadequate supplies of many kinds, the basic needs have been met.

The year that is now opening is a new year—with new problems and new opportunities. Indications point to still heavier traffic and still greater wear and tear, to continued shortage of sorely needed materials—to more acute shortages of labor. These conditions will call for even greater resourcefulness. The months ahead will not be easy months but they are in the interest of our supreme war effort. As such, they constitute a challenge to railway men—like a wreck or a winter's blizzard—and it is of such challenges to their ability and resourcefulness that railway maintenance forces are made.

Railways Spent $10,270,000 for

The Record Traffic Carried Made It Necessary to Surface an Unusual Amount of Track in 1942

DESPITE severe dislocations of manufacturing facilities and shortages in almost all of the materials that enter into their production, aggravated still further by a system of priorities that tended to slow down deliveries, the railways purchased 7,612 units of power machines and tools, of 156 different types, in 1942, at a total cost of $10,270,000. Although this is not the largest number of units of mechanized equipment purchased in a single year, it has been exceeded only once, in 1941, and then only by the narrow margin of 395 units.

Will Continue to Buy

While this number of power machines and tools would make an impressive array at any time, it becomes still more impressive when one considers that these purchases followed seven years of intensive buying of work equipment, which, with one exception, grew progressively larger year by year. It becomes startling when it is realized that these purchases were made under the most restrictive conditions of procurement that maintenance men have ever experienced. Furthermore, although most roads have not yet completed their budgets for 1943, enough of them have done so to indicate definitely that the roads as a whole are planning to buy more units than were purchased in either 1942 or 1941. In fact, because of the uncertainty of delivery dates, a number of roads have already placed orders for the power machines and tools they expect to need in 1943.

The fact that these purchases have increased steadily year by year for almost a decade is a demonstration of the place that work equipment has been making for itself under peacetime conditions in recent years. It is also an indication of the extent to which railway maintenance has been following the lead of industry with respect to mechanization. The further fact that the roads were able to convince the War Production Board that they needed this large number of units is an additional indication of the recognized value of these machines and of their ability to take the place of man-power in the present shortage of labor. As this shortage becomes more severe with increased inductions into military service, the need for power machines and tools will become more and more acute, for as man-power decreases they provide the only means by which the railways can be maintained to the standard necessary to insure dependability and safety in the movement of a traffic record-breaking in volume and importance.

Wide Diversity in Types

This situation is in strong contrast with that which existed a quarter century ago during the first year of World War I. At that time the development of work equipment was in its infancy. Even track motor cars, which are today taken as a matter of course, were by no means in universal use. Aside from locomotive cranes, bridge derricks, pile drivers, track-bound ditchers and steam shovels, maintenance officers had few mechanical aids.

One of the interesting and important facts disclosed by the purchases made in 1942 is the extraordinary diversity in the types of power machines and power tools that has been developed during the intervening 25 years. The roads giving information as to their purchases listed 156 different types, which compares with 152 different types in 1941, with 118 types in 1940 and 125 in 1939. In considering this amazing expansion in the use of work equipment and the many types that are now available to maintenance officers, one should not overlook the severe setback that purchases of all work equipment received immediately following the catastrophe of 1929.

Any well-directed study of this astounding expansion in the use of work equipment, of the new uses that are constantly being found for it, and of the many as yet unfilled needs for mechanical aids to maintenance, must lead to the conclusion that despite the expanding purchases of recent years, with respect to both the number of units and the diversity of types, the ultimate possibilities in the use of this equipment have not as yet even been approached. In other words, the large number of power machines and power tools already in use is no criterion of the ultimate possibilities of this equipment, for maintenance officers are realizing more and more the advantages of mechanizing their operations, and are taking advantage of all opportunities that are offered for them to do so.

Furthermore, the value of work equipment was emphasized by the

Work Equipment in 1942

To Speed Up War-Time Maintenance

Despite Difficulties Created by Shortages of Materials, 172 Roads Purchased a Total of 7,612 Power Machines and Tools of 156 Different Types Last Year. Budgets for 1943 Contemplate Still Larger Purchases

wage increases given to maintenance-of-way labor in 1941. It is being emphasized even more forcibly today by the growing shortage in all classes of labor employed in maintenance. That this value will increase during the coming months is not debatable, for there is no other substitute for the man-power that is growing less and less available as military needs and war industries are withdrawing more and more men from railway service and at the same time are depleting the supply from which the railways have heretofore been able to recruit men.

Even under peace-time conditions, no road has had all of the work equipment it needed, and only a negligible few have had enough of any particular type, with the possible exception of the motor car, and even this may be open to doubt. Under the abnormal conditions created by the war, there is a crying need for many types of work equipment, some of which have not been looked upon in some quarters as prime necessities. As recently as five years ago, certain maintenance officers were firm in the belief that their roads were fully equipped with all of the power machines and tools that they could use to advantage, and some of them said that they could use. Today, this belief is badly shattered, and it is convincing proof of the vital part work equipment is playing and is destined to play in maintenance that most of these officers are now strong advocates of a wider use of power machines and tools and that their roads are buying as many as the funds available to them will permit.

One of the important features connected with the production and use of work equipment, and one which cannot fail to exert a deep influence on the expansion of its use, is the manner in which manufacturers are constantly striving to improve their machines, both physically to increase their dependability, and from the viewpoint of operating ease and efficiency, as well as to adapt them to the new conditions which are continually arising. The results of this effort are apparent in the number of machines and tools that have been redesigned in whole or in part in recent years and in the important improvements that have been made in others. In this connection, not a few manufacturers have also redesigned a number of their machines and tools during the last two years to reduce or eliminate the use of critical materials, and in doing so have rendered a substantial service to both the nation and the railways.

Obsolescence Large Factor

Because of the intensive use to which power machines and tools are subjected in railway service and of the unavoidable abuse they sometimes receive, the mortality rate for this equipment is exceptionally high. Yet despite a normally short life for almost every type, the frequency with which these machines have been redesigned or otherwise improved has made obsolescence of as great importance potentially as wear in the replacement of existing units of work equipment.

Although the evidence is clear that many of the power machines and tools that were purchased in 1942 were for the replacement of worn out and obsolete units (for as long as power machines and power tools continue to be used, there will be a

Motor Car and Trailer Equipment for Extra Gangs Were Features of 1942 Purchases

large and stabilized demand for the replacement of such units as they become worn and out-moded, and for repair parts), there is equally convincing evidence that many others were obtained primarily as additions to the equipment already owned. In fact, this has been a particularly obvious feature of the purchases for the last two years. In both years this has been confirmed by the large number of units of certain types that were purchased by individual roads; by the fact that certain roads that had been limited users of work equipment have entered the market and bought in relatively large amounts; and by the large-scale purchases of types that have become available only recently or that have only recently been applied in maintenance.

To obtain the information that is given in detail on the following pages, inquiry was made of all of the roads in the United States, Canada and Mexico, as to their purchases of work equipment. Replies were received from 476 roads, representing 84 per cent of all of the railways in the three countries, including all but one Class I road in the United States. Of this number, 172 roads, 12 more than in any previous year, reported purchases of work equipment during the year and listed their purchases. This compares with 119 roads that made similar purchases in 1937, with 81 in 1938, with 124 in 1939, with 152 in 1940 and with 160 in 1941.

Keeping Equipment Modern

For several reasons it has been difficult for maintenance officers to realize the blight laid on their operations by obsolescence. One of the most important of these has been a continuation of the early practice of comparing the economy of machine operation with manual methods and in terms of manual labor. Obviously this was permissible when power machines were being introduced, for this was the most potent argument for their use that could be adduced, and still is for those maintenance operations that are just beginning to be mechanized. However, once a power machine or a power tool has become established, the comparison should be between the unit in service and the newer models that are available. That maintenance officers are more and more becoming aware of the undesirable effects of obsolescence is apparent in the constant effort that an increasing number of them are making to keep their equipment modern.

Probably the most outstanding evidence of this growing realization is found in the number and character of the motor cars purchased during the year. Furthermore, a study of these purchases will also give some indication of the present trends in maintenance practices. During 1942, a total of 2,639 motor cars of all classes were purchased, including a considerable increase in the number of heavy-duty cars, pointing to an increase in the number of large gangs, principally for laying rail and ballasting, as might have been expected from the increased appropriations for track maintenance. This interpretation is further confirmed by the purchase of 1,069 push cars and motor-car trailers, a very considerable increase over the purchases of these units in any previous year.

Again, the relatively large purchases of inspection cars during the year point to a continuation and probable extension of the trend that has been noticeable in recent years, of taking track inspection out of the hands of the section foremen and placing it in those of men assigned to cover several sections, whose principal duties are those of the old-time track walker. However, it must not be overlooked that the majority of the cars purchased during the year were of the lighter designs for section use, although section gangs were generally larger last year than they have been for several years.

It has been implied earlier in this discussion that the saturation point for work equipment is still well in the future; there are many indications that this point may never be reached. Confirmation of these statements is found in the continued purchases of motor cars, for motor cars have been used longer than all but a few other types of work equipment, while their use is so nearly universal that they can be employed to determine the truth or falsity of the theory of saturation as it applies to power machines and tools in maintenance. It is of particular interest, therefore, that despite the large surplus of motor cars that persisted until 1935 as a result of the force reductions and the consolidations of gangs that were made during the depth of the depression, and despite the relatively large purchases of motor cars in every year since 1935, except 1938, the number purchased in 1942, totaling 2,639 units of all types, is the largest number ever purchased in a single year. This should indicate quite clearly that if the point of saturation for this equipment has been reached, it has not destroyed the market for motor cars.

A similar illustration is to be found in tie tampers. This equipment, first developed as a practical mechanical aid for track maintenance only a quarter century ago, has had as wide or a wider use than any other type except the motor car. The value of tamping equipment has been demonstrated so clearly that the railways have bought liberally for a number of years. Yet the 1942 purchases, amounting to 344 complete tie-tamping outfits, ranging from 4 to 16 tools, and 593 tie-tampers of the unit type, give no indication that the point of saturation for this equipment is even being approached. On the contrary, they point definitely to a rapidly expanding use of this equipment.

In addition to the power plants that were included with these tie-tamping outfits, and with the welding equipment and the paint spraying outfits that were purchased during the year, the railways bought 73 air compressors and 50 generators. While some of these power plants were purchased to replace similar worn-out or obsolete units, particularly single-stage compressors, of which a considerable number still remain in service, the majority were additions to the equipment already in use, being purchased specifically for the purpose of operating small and portable power tools. As evidence that this is so, a total of 649 of these latter units were purchased during the year. While this is the largest number ever recorded for a single year, it is an understatement, for several roads reported purchases of power plants and "a set of portable bridge tools."

Two years ago, for the first time since 1929, the railways evinced considerable interest in earth-moving equipment, except that which is adapted for ditching. That this interest is being continued is shown by the purchase of 152 units of this equipment in 1942. This is 40 units more than were purchased in 1941 and 60 more than in 1940. Included in the total were 22 angle dozers and bulldozers, 19 carryalls and large-capacity scrapers, 12 draglines, 8 power shovels and 11 combination cranes-shovels-draglines, 4 graders, 1 spreader-ditcher and 39 buckets of various types for excavating. As a sign of the times, it is interesting to note that all of this equipment is off-track, except the spreader-ditcher, which has rail mountings.

Rail Equipment Added

Despite priorities, irregular deliveries and other disruptions of carefully-prepared programs, one of the major tasks that confronted the maintenance forces in 1942 was the

laying of 1,210,000 tons of rail. In preparation for this work, 420 units of rail-laying equipment were purchased, including spike pullers, bolt tighteners, adzing machines, rail cranes, rail and bonding drills, spike drivers and rail grinders. While some of these units were for replacement purposes, the greater part represented additions to existing equipment.

While it is becoming more and more necessary to defer work that is not essential to the moving of traffic, maintenance officers have a vivid recollection of the appearance of the track and right of way during the depth of the depression and of the task involved in cleaning it up after increased revenues made it possible to do so. For the last three or four years the railways have been cutting and generally clearing the right of way of the vegetation that was allowed to grow almost without molestation for six or seven years. To continue this work and take it out of the category of hand operations, the railways purchased 263 units of weed-destroying equipment in 1942, including track-mounted and off-track mowing machines, tractor mowers, power scythes, power mowers, discers, scarifiers, weed burners and chemical sprayers.

As might have been expected under the severe conditions imposed by war production and military demands, there was a decided slump in the number of highway vehicles purchased, except automobiles, the number of which was increased by about 56 per cent, compared with 1941. However, with the added traffic that is now being handled by the railways and because of further curtailment of local trains to provide enough cars to move army and naval personnel as becomes necessary, it has become practically impossible to get men or essential materials to most points on the railways without resorting to highway transportation. On this showing, the railways were able to obtain 151 motor trucks, 81 passenger automobiles and station wagons and 7 highway trailers, a total of 239 units, compared with 353 purchased in 1941. Incidentally, this reduction in highway vehicles accounted for a large part of the decrease in the total number of units purchased in 1942, compared with 1941.

There was an increase of 11 in the number of cranes purchased in 1942, compared with 1941, the number bought last year being 73, of which 14 were rail cranes and 12 were of the locomotive type, while the remaining 47 covered a considerable range of sizes. It is another illustration of the present trend in power machines that, except the rail cranes and a few of the locomotive cranes, all of this equipment was of the crawler type for off-track use.

Among the more important of the miscellaneous items that were purchased in 1942 were 12 ballast-cleaning machines, 1 pile driver, 3 steam pile hammers, 31 paint-spraying units, 35 tractors, mostly of the wheeled type, 29 welding outfits, a considerable number of which were for structural welding although some were intended primarily for the maintenance of manganese-steel trackwork, and 14 engines for work-equipment units other than motor cars, 130 engines having been purchased for the latter. In the purchase of these engines the beginning of a new trend becomes discernible, for several of them were of the Diesel type, which were purchased to replace gasoline engines in units that were undergoing major repairs. Another device, the use of which has been increasing in recent years is the rail and flange lubricator. The purchase of 545 units of this equipment during the year, a considerable number of which were of the two-rail type, indicates increased interest in rail conservation under the record-breaking traffic now passing over the railways.

A review of the number of units of work equipment purchased year by year since 1937, the first year for which this information was recorded, should be of interest to maintenance officers. The number for 1937 to 1942, inclusive, is as follows: 1937, 3,310 units; 1938, 1,376 units; 1939, 3,547 units; 1940, 5,414 units; 1941, 8,007 units; and 1942, 7,612 units. While there can be no question that increased income, beginning with 1940, was the principal factor leading to larger purchases in 1940 and 1941, yet a study of the purchases of individual roads, particularly of those in the southeastern states, shows quite clearly that the increasing wages of track labor was also an important factor in stimulating the purchase of work equipment in this area. A similar study of the purchases in 1942 will disclose the effect that the growing shortage of labor has had on the purchases during this year, and it will also give some insight into the increasingly acute need for mechanizing every operation that is susceptible to mechanization, and thus give an understanding of the fact that the roads are planning to buy as many and probably more units in 1943 than were purchased in 1941, the record year for these purchases.

A detailed list of all work equipment purchased in 1942 by all of the

Above—Unit Tampers and Tie Tamping Outfits Were in Demand. Below—Much Grading Equipment Was Purchased in 1942

railways in the United States, Canada and Mexico, except one Class I road in the United States, follows:

UNITED STATES

The Akron & Barberton Belt
1 Grinder, rail, portable

Akron, Canton & Youngstown
1 Concrete vibrator
1 Motor car, inspection
2 Motor cars, section
2 Motor cars, heavy duty
1 Pump, portable

Alaska
1 Engine for motor truck
1 Hammer, chipping
1 Motor truck
1 Sanding machine

Alton
1 Air compressor
1 Concrete mixer
14 Motor cars, inspection
12 Motor cars, section
2 Motor cars, heavy duty
1 Motor car engine
17 Motor car frames
3 Motor car trailers
1 Power mower

Alton & Southern
1 Grinder, rail, portable

Apache
1 Motor car, inspection
1 Motor car, section

Arkansas
1 Dragline
1 Motor car, heavy duty

Atlanta & Saint Andrews Bay
1 Motor car, inspection
2 Tie tamping outfits

Atlanta & West Point-Western Railway of Alabama
1 Drill, bonding
4 Motor cars, inspection
3 Motor cars, section
1 Motor car, heavy duty
1 Tie tamping outfit
1 Weed burner

Atlanta, Birmingham & Coast
1 Motor car, inspection
6 Motor cars, section
1 Motor car engine
10 Push cars

Atlantic & East Carolina
1 Bolt tightener
1 Motor car, inspection
10 Motor cars, section
1 Mowing machine

Atlantic & Western
1 Motor car, section

Atlantic & Yadkin
2 Motor cars, heavy duty
1 Mowing machine

Atlantic Coast Line
3 Air compressors
2 Bulldozers
3 Drills, rail
1 Earth auger
1 Paving breaker
4 Power units
9 Saws, power
12 Tie tamping outfits
1 Welding outfit
1 Wrench, impact

Baltimore & Ohio
1 Ballast cleaner
24 Bolt tighteners
4 Discers
16 Grinders, rail, portable
30 Motor cars, inspection
105 Motor cars, section
15 Motor cars, heavy duty
100 Tie tampers, unit type
9 Tie tamping outfits

Bangor & Aroostook
1 Jack, hydraulic power
1 Jackhamer
1 Motor car, inspection
2 Motor cars, section
1 Sander, electric
1 Sanding machine
1 Shovel, power
4 Tie tampers, unit type

Belt Railway of Chicago
1 Attachment for rail drill
2 Motor cars, inspection
1 Motor truck
2 Tie tampers, unit type

Bessemer & Lake Erie
4 Automobiles
2 Breakers, paving
2 Buckets, scoops for
1 Rail drill, heavy duty
10 Hammers, chipping
2 Hammers, scaling
2 Jackhamers
6 Motor cars, inspection
4 Motor cars, section
4 Motor car trailers
2 Motor trucks
1 Saw, circular
2 surfacers
4 Unit tie tampers
1 Tie tamping outfit
4 Tie tamping tools

Bingham & Garfield
1 Crane
1 Motor car engine
1 Paint spraying outfit
1 Spike puller

Birmingham Southern
2 Automobiles
2 Motor cars, heavy duty
1 Motor truck

Blue Ridge
2 Motor cars, section

Bonhomie & Hattiesburg Southern
2 Motor car engines

Boston & Maine
3 Air compressors
4 Grinders, rail, rail mounted
2 Hammers, steam pile
2 Jacks, hydraulic power
1 Motor car, section
1 Motor car, heavy duty
2 Motor trucks
2 Mowing machines
2 Saws, rail
10 Tie tampers, unit type
6 Tie tamping outfits
1 Welding outfit
2 Wrenches, power

Burlington-Rock Island
1 Discer
3 Motor cars, inspection
5 Motor cars, section
1 Motor car, heavy duty
1 Mowing machine

Cambria & Indiana
1 Motor car, inspection
1 Paint spraying outfit
2 Rail and flange lubricators

Canton
2 Cranes

Central of Georgia
1 Creosote spraying outfit
1 Grinder, rail, portable
4 Motor cars, inspection
1 Motor car, section
1 Motor car, heavy duty
1 Mowing machine
6 Rail and flange lubricators
4 Tie tamping outfits
3 Weed burners

Central of New Jersey
3 Air compressors
1 Bulldozer
1 Fire extinguisher car
1 Grinder, rail, portable
1 Motor car, heavy duty
1 Push car
16 Tie tampers, unit type
1 Weed burner
2 Welding outfits

Charleston & Western Carolina
1 Grader
2 Motor car engines
24 Rail and flange lubricators
1 Tractor

Chattahoochee Valley
1 Motor car, section
1 Motor car, heavy duty
1 Tie tamping tool

Chesapeake & Ohio
1 Automobile
1 Crane, rail
3 Drills, rock
25 Motor cars, inspection
67 Motor cars, section
7 Motor cars, heavy duty
1 Motor truck
1 Paving breaker
1 Pump, portable
9 Rail and flange lubricators

Many Power Machines of Various Types Were Ordered and Used to Advantage in Completing 1942 Rail Programs

1 Saw, timber
11 Tie borers

Chicago & Eastern Illinois
1 Tie tamping outfit

Chicago & Illinois Midland
2 Motor cars, inspection
2 Motor trucks

Chicago & North Western
1 Air compressor
2 Drills, steel
26 Motor cars, inspection
20 Motor cars, section
6 Motor cars, heavy duty
2 Mowing machines
13 Rail and flange lubricators
2 Saws, rail
22 Tie tampers, unit type
1 Tie tamping outfit

Chicago & Western Indiana
2 Automobiles
1 Grinder, rail, portable
3 Hand cars
1 Motor car, heavy duty
6 Push cars
1 Welding outfit

Chicago, Burlington & Quincy
2 Adzing machines
12 Automobiles
5 Bolt tighteners
2 Buckets, clamshell
2 Buckets, dragline
3 Concrete mixers
2 Demolition tools
1 Discer
7 Drills, steel
1 Drill, rock
2 Engines, rotating for clamshells
1 Grinder, rail, rail mounted
2 Grinders, rail, portable
9 Hammers, chipping
4 Hammers, riveting
68 Motor cars, inspection
105 Motor cars, section
7 Motor trucks
2 Truck-tractors
15 Motor scythes
11 Mowing machines
9 Rail and flange lubricators
2 Jam riveters
1 Saw, rail
2 Scrapers, roll-over type
2 Spike pullers
8 Tie cutters
5 Tie pullers
2 Tie tampers, unit type
12 Tie tamping outfits
3 Wrenches, impact

Chicago Great Western
2 Motor cars, inspection
1 Motor car, section
3 Motor cars, heavy duty
7 Motor car engines
2 Push cars

Chicago, Indianapolis & Louisville
1 Adzing machine
1 Bolt tightener
1 Concrete mixer
4 Drills, bonding
2 Grinders, rail, portable
2 Motor cars, inspection
19 Motor cars, section
16 Rail and flange lubricators
1 Saw, chain
1 Saw, circular
2 Tie tampers, unit type
8 Tie tamping outfits

Chicago, Milwaukee, St. Paul & Pacific
1 Air compressor
10 Bolt tighteners
1 Crane, crawler mounted
2 Cranes, rail mounted
3 Drills, rail
20 Motor cars, inspection
130 Motor cars, section
12 Motor cars, heavy duty
2 Power mowers
1 Saw, rail
1 Shovel, power
5 Spike drivers
8 Tie cutters
4 Tie tamping outfits

Chicago, Rock Island & Pacific
1 Adzing machine
4 Automobiles
1 Bolt tightener
1 Concrete vibrator
2 Drills, bonding
6 Jackhamers
31 Motor cars, inspection
63 Motor cars, section
6 Motor trucks
2 Mowing machines
3 Saws, timber
2 Tie spray machines
8 Tie tampers, unit type
6 Wrenches, power

Chicago, St. Paul, Minneapolis & Omaha
1 Motor car, inspection
5 Motor cars, section
3 Motor cars, heavy duty
1 Weed burner
2 Weed mowers

Clinchfield
1 Motor car engine
2 Welding outfits

Colorado & Southern
7 Motor cars, inspection
9 Motor cars, section
1 Mowing machine, tractor-type

Colorado & Wyoming
1 Air compressor
1 Blasting machine
1 Jack, push pull type
1 Jackhamer
1 Motor car engine
1 Shovel, power, combination dragline
4 Tie tampers, unit type
2 Welding outfits

Columbus & Greenville
2 Motor car engines

Coudersport & Port Allegany
1 Motor truck

Danville & Western
2 Motor cars, section

Delaware & Hudson
2 Air compressors
1 Crane, rail
1 Discer
2 Drills, rail
2 Motor car engines
5 Power mowers
3 Saws, rail
1 Saw, timber
12 Tie tampers, unit type
3 Tie tamping outfits
3 Wrenches, impact

Denver & Rio Grande Western
2 Air compressors
9 Automobiles
1 Concrete breaker
1 Crane, rail
1 Motor car, inspection
8 Motor trucks
1 Mowing machine
1 Saw, chain
1 Saw, circular
1 Spike puller
30 Tie tampers, unit type
8 Tie tamping outfits
1 Welding outfit
1 Power winch
1 Wood borer
1 Wrench, power

Denver & Salt Lake
2 Motor cars, inspection

Detroit & Mackinac
1 Motor car, inspection
8 Tie tampers, unit type
1 Welding outfit

Detroit & Toledo Shore Line
1 Motor car, inspection
1 Motor car, section
4 Tie tampers, unit type

Detroit, Toledo & Ironton
6 Motor cars, inspection
5 Motor cars, section
4 Power mowers

Donora Southern
1 Drill, rail
1 Grinder, rail, portable
1 Saw, rail

Duluth & Northeastern
1 Discer

Duluth, South Shore & Atlantic
1 Generator, portable
1 Saw, chain

Durham & Southern
1 Motor car, section

East Broad Top Railroad & Coal Company
2 Air compressors
1 Bolt tightener
1 Drill, rail
1 Motor car, heavy duty
2 Spike drivers
8 Tie tampers, unit type
1 Wood borer
1 Wrench, impact

Elgin, Joliet & Eastern
2 Air compressors

The Heavy Rail Sections of Today Cannot Be Handled Safely or Laid Correctly Without the Aid of Power Equipment

1 Grinder
8 Motor cars, inspection
11 Motor cars, section
3 Motor cars, heavy duty
2 Motor trucks
1 Pump, portable
14 Rail and flange lubricators
15 Switch heaters

Erie
2 Bolt tighteners
1 Concrete breaker
2 Concrete mixers
1 Crane
1 Dragline
1 Drill, rail
1 Grinder, rail, rail mounted
1 Jack, pusher

2 Ballast drainage cars
4 Bolt tighteners
5 Buckets, clamshell
4 Buckets, dragline
1 Bulldozer
4 Carryall scrapers
4 Concrete buggies
4 Concrete mixers
1 Concrete vibrator
1 Conveyor, portable
6 Creosote sprayers
1 Crane, combination dragline
1 Crane, rail
1 Crane, truck mounted
11 Derricks, hand operated
3 Derricks, power
1 Detector car

Depleted Bridge Gangs Find Power Tools of Great Assistance in Completing Maintenance Programs

8 Motor cars, inspection
2 Motor cars, section
27 Motor car trailers
1 Motor truck
1 Paint spraying outfit
1 Pipe threading machine
23 Rail and flange lubricators
1 Tie borer
1 Weed burner
1 Wrench, impact
1 Wrench, power

Etna & Montrose
1 Grinder, rail, portable

Florida East Coast
2 Adzing machines
1 Drill, rail
1 Grinder, rail, rail mounted
1 Pile extractor
1 Saw, rail

Ft. Worth & Denver City
1 Air compressor
3 Automobiles
1 Dragline
5 Motor cars, inspection
8 Motor cars, section
2 Motor cars, heavy duty
1 Mowing machine
2 Tie tamping outfits

Galveston Wharves
1 Crane, locomotive
1 Jackhamer
1 Paving breaker
1 Power mower

Georgia & Florida
1 Air compressor
1 Automobile
1 Motor car, inspection
1 Motor car, section

Georgia
1 Motor car, inspection
7 Motor cars, section
1 Motor truck
1 Tie tamping outfit

Great Northern
3 Adzing machines
4 Air compressors
5 Angle dozers
13 Automobiles

1 Discer
3 Drills, bonding
27 Drills, electric
1 Drill, pneumatic
2 Drills, rail
1 Drill, rock
1 Earth boring machine
1 Engine, gas
6 Forges, rivet
7 Generators, portable
1 Blade grader
1 Grinder
1 Grinder for chain saw blades
3 Hammers, chipping
1 Hammer, riveting
6 Hoists, hand
11 Hoists, power
2 Holders on
4 Jacks, power
1 Jackhamer
48 Motor cars, inspection
55 Motor cars, section
9 Motor cars, heavy duty
3 Motor car frames
39 Motor car trailers
10 Motor trucks
1 Mowing machine
7 Mowing machines, tractor type
5 Paint spraying outfits
3 Paving breakers
1 Plow
6 Two drum power control units
4 Pumps, portable
24 Rail and flange lubricators
3 Rivet busters
5 Floor sanders
1 Sander and buffer
12 Saws, brush
11 Saws, chain
15 Saws, timber
2 Power shovels, combination dragline and crane
8 Spike drivers
1 Spike puller
2 Tie cutters
24 Tie tamping outfits
7 Tractors
1 Tractor, industrial type
5 Trailers, highway
5 Weed burners
2 Welding outfits

8 Wood borers
3 Wrenches, impact

Green Bay & Western
3 Motor cars, inspection
3 Motor cars, section

Gulf, Mobile & Ohio
6 Motor cars, inspection
12 Motor cars, section
20 Rail and flange lubricators
14 Tie tampers, unit type

High Point, Thomasville & Denton
1 Motor truck

Houston Belt & Terminal
1 Air compressor
3 Motor cars, inspection
4 Motor cars, section

Illinois Central
2 Adzing machines
3 Air compressors
9 Bolt tighteners
1 Crane, rail
1 Discer
1 Dragline
3 Drills, bonding
3 Drills, rail
1 Grinder, rail, portable
6 Motor cars, inspection
25 Motor cars, section
2 Motor cars, heavy duty
7 Motor trucks
3 Mowing machines
8 Pumps, portable
5 Rail and flange lubricators
2 Spike drivers
2 Spike pullers
38 Tie tampers, unit type
12 Tie tamping outfits
2 Tractors

Illinois Terminal
2 Automobiles
6 Motor cars, inspection
3 Motor cars, section
2 Motor cars, heavy duty

Ironton
1 Grinder, rail, portable

Kansas City Southern
1 Crane, rail
2 Drills, steel
16 Motor cars, inspection
28 Motor cars, section
14 Motor cars, heavy duty
1 Motor car engine
16 Motor car trailers
1 Rail and flange lubricator
6 Tie tamping outfits

Lakeside & Marblehead
1 Motor car, section

Lehigh & Hudson River
1 Motor car, inspection
2 Motor cars, heavy duty
4 Push cars
2 Trailers, highway

Lehigh & New England
1 Grinder, rail, portable
1 Motor car, inspection
6 Rail and flange lubricators
1 Saw, rail

Lehigh Valley
3 Adzing machines
2 Motor car engines
3 Spike pullers

Live Oak, Perry & Gulf
1 Motor car, inspection
1 Motor car, heavy duty
1 Motor car engine

Louisiana Southern
1 Motor car, section
1 Mowing machine
1 Pump, portable

Louisville & Nashville
6 Air compressors
1 Ballast drainage car
1 Bucket, dragline
1 Bull grader

4 Concrete mixers
1 Drill, rail
2 Hammers, riveting
1 Hammer, scaling
10 Jackhamers
1 Lifting magnet
41 Motor cars, inspection
12 Motor cars, section
37 Motor cars, heavy duty
4 Paving breakers
18 Power mowers
1 Fire pump
2 Pumps, portable
2 Spike pullers
2 Wrenches, impact

McCloud River
1 Automobile
1 Motor car, section

Macon, Dublin & Savannah
2 Jacks, 50 ton bridge
5 Motor cars, inspection
1 Motor truck
2 Pumps, portable

Maine Central
4 Rail benders
2 Cranes
1 Drill, steel
9 Motor cars, inspection
11 Motor cars, section
10 Motor cars, heavy duty
6 Motor car trailers
1 Mowing machine
3 Pumps, portable
6 Push cars
1 Snow plow, attachment for truck

Manistee & Northeastern
1 Motor car, section

Marianna & Blountstown
1 Motor car, section

Maryland & Pennsylvania
1 Grinder, rail, portable
1 Motor car, inspection
2 Motor cars, section

Minneapolis & St. Louis
1 Drill, steel
1 Generator, portable
2 Pumps, portable electric
1 Saw, chain
2 Saws, circular
2 Weed burners

Minneapolis, Northfield & Southern
1 Ditcher-spreader

Minneapolis, St. Paul & Sault Ste. Marie
2 Air compressors
4 Generators, portable
10 Motor cars, section
10 Motor car engines
4 Motor trucks
2 Paint spraying outfits
4 Power mowers
1 Pump, portable
4 Saws, chain
4 Tie cutters
1 Tractor

Minnesota Transfer
1 Drill, rail

Mississippi Central
1 Drill, rail
1 Motor car, heavy duty
1 Saw, rail

Mississippi Export
2 Motor cars, section

Missouri & Arkansas
2 Motor cars, heavy duty
3 Push cars

Missouri-Kansas-Texas
1 Air compressor
3 Motor cars, inspection
12 Motor cars, section
2 Motor cars, heavy duty
4 Mowing machines

Missouri Pacific Lines
A-Missouri Pacific
2 Adzing machines
2 Bolt tighteners
1 Crane, rail
4 Draglines
3 Drills, rail
1 Engine for dragline
7 Generators, portable
1 Grader
1 Grinder, rail, portable
1 Joint oiler
58 Motor cars, inspection
9 Motor cars, section
17 Motor cars, heavy duty
13 Mowing machines, tractor type
3 Mowing machines
1 Paint spraying outfit
2 Pumps, portable
85 Rail and flange lubricators
1 Saw, rail
2 Pick-up scrapers for wheel tractor
4 Scrapers
2 Spike drivers
120 Tie tampers, unit type
12 Tie tamping outfits
4 Tractors
5 Weed burners
1 Welding outfit
1 Wrench, impact

B-Gulf Coast Lines
1 Adzing machine
1 Air compressor
1 Bolt tightener
2 Drills, steel
2 Generators, portable
1 Grinder, rail, rail mounted
6 Motor cars, inspection
3 Motor cars, section
18 Motor car engines
6 Motor car frames
4 Mowing machines
2 Pumps, portable
2 Wrenches, power

Weed-Destroying Equipment Is Given a Large Place in Current Budgets

C-International-Great Northern
1 Bull grader
1 Concrete mixer
8 Motor cars, inspection
6 Motor cars, section
6 Motor cars, heavy duty
18 Motor car engines
6 Motor car frames
1 Mowing machine
1 Pump, portable
1 Scraper
1 Tractor

D-Missouri-Illinois
2 Motor cars, inspection
3 Motor cars, section
1 Motor car, heavy duty
1 Mowing machine

Monongahela
2 Motor cars, inspection
1 Motor car, section
1 Motor truck

Montana, Wyoming & Southern
1 Motor car trailer

Nashville, Chattanooga & St. Louis
2 Adzing machines
4 Grinders, rail, portable
5 Motor cars, inspection
30 Motor cars, section
3 Paint spraying outfits
4 Tie tamping outfits

Nevada Copper Belt
4 Push cars
1 Saw, timber
2 Spike pullers

Nevada Northern
1 Motor car, heavy duty

New Orleans Public Belt
2 Motor cars, inspection

New York Central Lines
A-New York Central
2 Air compressors
6 Ballast cleaners
11 Bolt tighteners
1 Bucket, clamshell
2 Drills, rail
5 Drills, steel
2 Grinders, rail, rail mounted
1 Grinder, rail, portable
34 Motor cars, inspection
36 Motor cars, section
20 Motor cars, heavy duty
1 Motor truck
7 Mowing machines
3 Paving breakers
4 Rail and flange lubricators
2 Rail layers, power
1 Saw, rail
1 Shovel, power
1 Snow sweeper
12 Spike drivers
10 Tie tampers, unit type
23 Tie tamping outfits
2 Welding outfits

B-Boston & Albany
2 Ballast cleaners
4 Bolt tighteners
1 Generator, portable
6 Motor cars, section
1 Pump, portable
16 Tie tampers, unit type
6 Tie tamping outfits

C-Chicago River & Indiana
1 Drill, rail
1 Welding outfit

D-Cleveland, Cincinnati, Chicago & St. Louis
2 Automobiles
1 Swing conveyor for ballast cleaner
2 Discers
8 Drills, bonding
10 Drills, rail
2 Drills, steel
7 Grinders, rail, portable
10 Motor cars, inspection
18 Motor cars, section
6 Motor cars, heavy duty
18 Motor car trailers
2 Motor trucks
1 Pump, portable
1 Rail and flange lubricator
1 Saw, rail
4 Spike drivers
16 Tie spacers
39 Tie tamping outfits

7 Wood borers
4 Wrenches, power

E-Indiana Harbor Belt
1 Bolt tightener
1 Drill, rail
1 Motor car, inspection
1 Motor car, section
2 Motor cars, heavy duty
1 Paint spraying outfit

F-Michigan Central
2 Ballast cleaners
3 Bolt tighteners
3 Drills, rail
4 Grinders, rail, portable
22 Motor cars, inspection
33 Motor cars, section
6 Motor cars, heavy duty
3 Mowing machines
6 Mowing machines, tractor type
6 Power mowers
1 Shovel, power
6 Spike drivers
4 Tie borers
8 Tie tampers, unit type
9 Tie tamping outfits
12 Pneumatic tie tamping tools

G-Peoria & Eastern
1 Discer
1 Grinder, rail, portable
3 Motor cars, section
2 Mowing machines
1 Tie tamping outfit

H-Pittsburgh & Lake Erie
2 Air compressors
1 Concrete mixer
1 Drill, rail
4 Motor cars, inspection
3 Motor cars, section
1 Motor car, heavy duty
1 Saw, rail
35 Tie tamping outfits

New York, Chicago & St. Louis
1 Automobile
1 Bulldozer
12 Motor cars, inspection
17 Motor cars, section
1 Motor car, heavy duty
2 Motor trucks
1 Mowing machine
3 Tie tamping outfits

New York, New Haven & Hartford
6 Automobiles
9 Buckets, clamshell
1 Welding outfit
2 Wrenches, power

New York, Ontario & Western
2 Cranes, crawler mounted
1 Discer
6 Motor cars, section
2 Saws, timber
1 Wrench, impact

Norfolk & Western
6 Cars, side dump
1 Concrete mixer
2 Cranes, rail
8 Motor cars, section
5 Motor cars, heavy duty
1 Pipe cleaning outfit
16 Rail and flange lubricators
2 Tractors

Norfolk Southern
1 Motor car, inspection
2 Motor cars, section
2 Motor car frames
1 Rail and flange lubricator
1 Saw, rail

Northeast Oklahoma
1 Automobile
2 Motor cars, section
1 Motor truck

Oregon & Northwestern
1 Automobile

Pennsylvania
5 Air compressors
2 Power ballasters
3 Bolt tighteners
8 Buckets, clamshell
7 Bullgraders
9 Concrete breakers
2 Concrete mixers
12 Cranes, crawler
2 Cranes, truck
3 Generators, portable
5 Generators for welding units
3 Grinders, rail, portable
46 Motor trucks
3 Mowing machines, tractor type
4 Paint spraying outfits
4 Pumps, portable
8 Spike drivers
12 Tie tampers, unit type
3 Tie tamping outfits

Peoria & Pekin Union
1 Air compressor
1 Cement gun

Power Saws Save Much Time and Effort in Building Work

Pittsburg & Shawmut
4 Motor cars, section

Port Angeles Western
1 Motor car, heavy duty

Port Townsend Southern
1 Motor car, section

Quanah, Acme & Pacific
1 Motor car, inspection
1 Motor car engine
1 Mowing machine
1 Power mower

Quincy
1 Motor car, section
1 Motor car trailer

Rahway Valley
1 Motor car, heavy duty

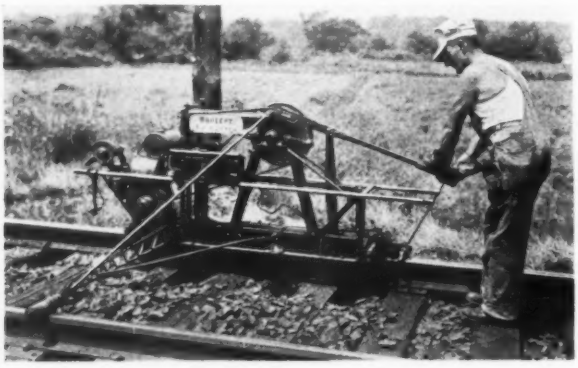
Reading
1 Adzing machine
1 Bolt tightener
1 Bucket, orange-peel
3 Cranes, crawler mounted
1 Drill, bonding
1 Drill, rail
1 Grinder, rail, portable
50 Motor car trailers
5 Rail and flange lubricators
32 Tie tampers, unit type
1 Tractor

Richmond, Fredericksburg & Potomac
1 Ballast cleaner
1 Drill, rail
1 Motor car, inspection
1 Motor car, section
1 Saw, rail
1 Tie tamping outfit

River Terminal
1 Welding outfit

St. Louis-San Francisco
2 Air compressors
2 Bolt tighteners
2 Drills, rail
4 Generators, portable
7 Motor cars, inspection
10 Motor cars, section
4 Motor cars, heavy duty
4 Motor car engines
28 Mowing machines
100 Rail and flange lubricators
6 Tie tamping outfits
2 Tractors

St. Louis Southwestern
5 Motor cars, inspection
1 Motor car, section
1 Motor car, heavy duty
11 Motor car engines
4 Mowing machines, tractor type
1 Pump, centrifugal
1 Saw, rail
8 Tie spacers
1 Tie tamping outfit



Tie Cutters Save Time and Labor for the Reduced Maintenance Forces in Carrying Out the Tie-Renewal Program

1 Bucket, dredge
9 Cranes, locomotive
2 Cranes, crawler mounted
4 Cranes, combination shovel-dragline
8 Generators, portable
1 Grinder, rail, portable
7 Motor cars, inspection
16 Motor cars, heavy duty
4 Motor trucks
9 Truck chassis
25 Rail and flange lubricators
10 Tie tampers, unit type
1 Tractor
2 Motor cars, inspection
1 Motor car, section

Pere Marquette
1 Bolt tightener
1 Crane, rail
1 Grinder, rail, rail mounted
12 Motor cars, inspection
14 Motor cars, section
1 Mowing machine
1 Saw, rail
1 Tie borer
18 Tie tampers, unit type
3 Tie tamping outfits

San Luis Central
1 Motor car, section
1 Pump, portable

Seaboard Air Line
6 Automobiles
2 Drills, rail
6 Grinders, rail, portable
31 Motor cars, inspection
26 Motor cars, section
2 Motor cars, heavy duty
12 Motor trucks
6 Mowing machines
2 Pumps, portable
20 Rail and flange lubricators
1 Power rail layer
1 Saw, rail
1 Weed burner

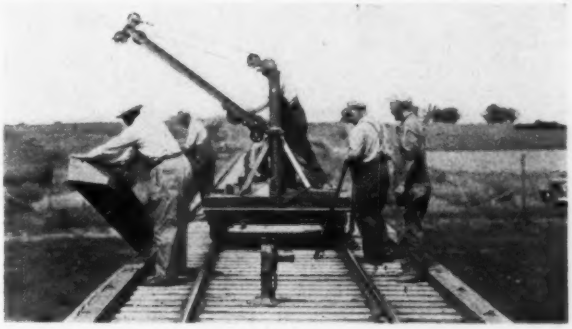
Southern
12 Adzing machines
1 Air compressor
3 Bolt tighteners
5 Concrete mixers
9 Concrete vibrators
1 Scarifier
9 Drills, rail
1 Generator, portable
4 Grinders, rail, portable
51 Motor cars, inspection
81 Motor cars, section
24 Motor cars, heavy duty
28 Motor car engines
3 Paint spraying outfits
1 Pump, portable
568 Push cars
20 Rail and flange lubricators
20 Saws, rail
2 Scrapers, wagon
2 Tie pullers
20 Tie tamping outfits
2 Tractors

Southern Pacific System
A—Pacific System
2 Air compressors
2 Bolt tighteners
2 Carryall scrapers
6 Concrete mixers
1 Drill, stopehamer

Earth Borers Make Closer Spacing of Piles Possible in Foundations

4 Engines for welding generators
3 Grinders, rail, rail mounted
17 Jackhamers
51 Motor cars, inspection
49 Motor cars, section
28 Motor cars, heavy duty
2 Motor trucks
1 Mowing machine
4 Paint spraying outfits
3 Pumps, portable
2 Saws, chain
4 Saws, table
1 Shovel, power
1 Tie tamping outfit
5 Tractors
1 Welding outfit
8 Wood borers

B—Lines in Texas & Louisiana
3 Automobiles
2 Concrete breakers
1 Crane, rail



Small Derrick Cars for Bridge Gangs Facilitate the Handling and Placing of Heavy Timbers in Structures

12 Derricks
1 Discer
6 Drills, rail
8 Floodlights
4 Grinders, rail, rail mounted
3 Grinders, rail, portable
4 Hammers, riveting
4 Jackhamers
17 Motor cars, inspection
12 Motor cars, section
12 Motor cars, heavy duty
3 Motor trucks
1 Mowing machine
2 Paint spraying outfits
1 Pipe cutting and beveling machine, power operated
9 Rail and flange lubricators
6 Saws, timber
10 Tie tamping outfits
1 Weed burner
2 Welding outfits
6 Wood borers
4 Wrenches, power

C—Northwestern Pacific
1 Adzing machine
6 Motor cars, inspection
3 Motor cars, section
2 Motor cars, heavy duty
1 Weed mower

D—San Diego & Arizona
1 Motor car, section

Spokane International
5 Motor cars, section
1 Motor truck
1 Power shovel

Spokane, Portland & Seattle
6 Motor cars, inspection
6 Motor cars, section
2 Motor cars, heavy duty
8 Motor car trailers
2 Motor trucks
1 Power mower
1 Scraper
9 Tie tampers, unit type
1 Tractor

Tennessee Central
1 Motor car, inspection

Terminal Railroad Association of St. Louis
3 Air compressors
4 Automobiles
1 Car puller
4 Drills, steel
1 Electric light plant
8 Grinders
1 Grinder, rail, rail mounted
1 Hammer, chipping
1 Jackhamer
2 Motor cars, heavy duty
1 Paving breaker
7 Push cars
19 Rail and flange lubricators
3 Rivet busters
4 Scaling tools
4 Tie tampers, unit type
2 Weed burners
6 Welding outfits
2 Wood borers
1 Wrench, impact

Texas & Pacific
2 Bolt tighteners
1 Crane, rail
2 Drills, rail
34 Motor cars, inspection
27 Motor cars, section
5 Motor cars, heavy duty
1 Motor truck
19 Saws, timber
1 Saw, rail
2 Tie tampers, unit type
31 Tie tamping outfits

Texas City Terminal
2 Motor cars, inspection
1 Pump, portable

Toledo, Peoria & Western
3 Automobiles
2 Motor cars, inspection
3 Motor cars, section

Toledo Terminal
3 Motor cars, inspection
2 Tie tampers, unit type

Tremont & Gulf
3 Motor cars, section

Trona
1 Discer
2 Motor car engines
1 Motor truck

Union
2 Cranes, locomotive
1 Drill, bonding
3 Motor cars, inspection
1 Motor car, heavy duty
5 Rail and flange lubricators
1 Wrench, power

Union Pacific
2 Air compressors
1 Bolt pulling machine
2 Dragline buckets
2 Bull graders
3 Drills, rail
2 Hose hook-up
1 Jack clutch jaw
1 Power jack
11 Jackhamers
58 Motor cars, inspection
115 Motor cars, section
7 Motor car engines
10 Mowing machines
131 Push cars
1 Rivet buster
1 Scaling tool
2 Tie tampers, unit type
9 Tie tamping outfits
2 Tractors

(Continued on page 48)

Why Have Motor-Car Accidents?*

By C. F. Larson

Superintendent of Safety†
Missouri Pacific Lines, St. Louis, Mo.

THE ugly fact faces railway officers that motor-car accidents happen with too-great frequency and many times result in serious personal injury and property damage. Derailments account for a large number of these accidents. Derailments of motor cars may be caused by too-high speed, especially on curves; they occur on branch lines where the maintenance of the track is to a lower standard than on the main line; by failure of wheels and worn flanges; by reason of deficient brakes that do not act effectively in emergency. Many derailments of motor cars have been caused by improper loading of tools, so that tools fell in front of the cars. They are frequently derailed at street and highway crossings by failure to slow down to a safe speed, as there may be mud or ice in the flangeway that will raise the wheel off the rail. Small animals, such as dogs or pigs, coming unexpectedly onto the track in front of the car are quite likely to derail it. Allowable speeds for motor cars are provided in the rules and when speed is a factor it is usually not difficult to place the responsibility for the accident.

Responsibility rests with the foreman or the operator or with both. Wheels that are out of alinement or gage or that are sprung, must be taken care of by maintainers who will check them, and wheels that are found to be unsuitable for use must be replaced, regardless of the minimum thickness of the wheel. Wheel calipers are furnished to supervisors, repairmen and maintainers, and wheels on motor cars, push cars and trailers should be checked with these calipers at least once a month by roadmasters and supervisors and at every opportunity by maintainers and repairmen.

We now reach the most serious aspect of the subject, collisions of motor cars with trains or other motor cars. This type of accident, dreadful in its results, is so uncalled for that it is difficult to understand why it occurs. A few typical cases will show the complete lack of excuse for such accidents.

A signalman started out on his motor car to look for "trouble." He was provided with a standard watch and an employee's timetable, and he was acquainted with the schedule of every train shown in the timetable. Notwithstanding this knowledge, he went out on the main track in the face of a fast passenger train, collided with it and was killed, the car being demolished. Why did this accident happen? The answer is shrouded in mystery.

In the same territory, another signalman did substantially the same thing, although the basis for his action is less of a mystery. He left a telegraph office where he had learned that a fast passenger train was on time. He started out in the same direction the train was moving, was overtaken, his car was demolished and he was killed. It is assumed that he thought he could beat the train to the next station. This was a case of taking a chance on doing something that common sense should have told him he could not do.

A section motor car, going out to work in curved territory, collided with a scheduled freight train, demolishing the car and resulting in several personal injuries. The rules of the railway upon which this accident occurred provide that a line-up may be obtained in writing, showing the approximate time of arrival at the station at which the information is obtained, of every train moving at that time, which may arrive within the following three hours. This information is for use in planning work to minimize delays to traffic, and not as authority to occupy the main track.

Main track may be occupied by track cars only by full compliance with all rules. In territory designated by the superintendent, where curves may cause excessive delay to motor cars, special instructions may be issued which provide for the furnishing of complete and definite information on trains, to be used by the foreman in going to and returning from work. Such information, while positive and definite with respect to trains, does not relieve the foreman and others from employing the care and caution necessary for safety.

No one, except a responsible employee who has qualified by passing such examinations as may be prescribed, who has a standard watch and who has familiarized himself with the rules and instructions, should be permitted to operate a car on the main track. With these requirements fulfilled, we have a right to believe that we have a man who will respond cheerfully and loyally to these demands for safe and sane operation. Yet, the examples that were cited were actual cases of accidents to men who had qualified.

Have We Gone Far Enough?

What is the answer to this problem? It may be that we have not gone far enough in making the selection of the individual in whom we have placed this responsibility. He may be able to pass the stipulated examinations and yet possess attitudes that will cause him to do things, perform acts, in direct opposition to the rules and instructions upon which he has quite easily and satisfactorily passed examination. What is his mental make-up? Is he a "crabber"? Does he nurse grievances? The crabber and the troublemaker have no place on a railway pay roll.

A man is sometimes over-eager to accomplish. In this event, his mind may be centered so entirely upon the work he is doing, or is about to do, that he may rush into danger unwittingly. Again, our subject may be a man of confused mind, conscious of his danger but in his confusion his mind does not comprehend its true nature or react to avoid it. Then there is the chance-taker whom we have already seen.

What can be done to overcome them? We might look at the word discipline and study it, not from the punitive viewpoint, but as the basis for teaching, for training and for obtaining efficient and orderly conduct and effective compliance with rules.

This subject is a serious one and represents a puzzling problem on all railroads. I have attempted by illustration to picture some actual accidents and then demonstrate how the management of the Missouri Pacific Lines has set about, by promulgating rules that will fit into every situation, to overcome these useless and unnecessary accidents that result in personal injuries and the destruction of valuable property.

*This discussion was submitted in response to the question "What are the most important factors contributing to motor-car accidents? What can be done to overcome them?" Because of its comprehensive character, it was withheld for presentation as an independent article. For further discussion of this subject, see the April, 1942 issue, page 287.

†Retired on January 1, 1943.

A Dowell Truck Used for the Acid Treatment of Wells

Illinois Central Acidizes Three Wells

With few exceptions, ground-water supplies obtained at a considerable depth from sand or gravel formations, diminish in the course of time because some of the dissolved solids are precipitated on the screen and in the channels leading to the well, as the water enters the well under reduced pressure. The common method of restoration is to dissolve this scale by means of hydrochloric acid. This article describes how the Illinois Central used the acid with an inhibitor to prevent damage to the screens, in rejuvenating gravel-wall wells at Paxton, Ill., and a well at Pesotum

THE Illinois Central recently found itself faced with a diminishing delivery from the wells at two of its water supply stations in Central Illinois and, at the same time, with the necessity for meeting increased demands for water by reason of the record-breaking traffic it is now handling. To meet this situation and assure a continuing supply of water, the wells were cleaned in a way that resulted in greatly increased flow at Paxton, and a moderate increase at Pesotum.

Paxton is an important water station, 102 miles south of Chicago on the main line to New Orleans. Water is derived from two gravel-wall wells drilled through a water-bearing sand stratum to a depth of 150 ft. below the surface. They were installed in 1923 to replace two older wells that had to be abandoned in connection with a grade-reduction project that was carried out during that year. Although the station at Pesotum, 40 miles south of Paxton, is of less importance, in that it is primarily an emergency supply, diminishing flow in the single well at this point indicated that the supply might become inadequate for even the relatively light demands that are made upon it.

There has been a slow decline in the production from the wells at Paxton during the 20 years they have been in service, but the immediate trouble was incrustation of the well screens and gravel walls by mineral deposits from the inflowing water, causing a sharp reduction in the potential pumping rate. Likewise, production in the well at Pesotum has declined gradually since it was completed in 1919, at which time it was drilled to a depth of 258 ft. The immediate trouble here was the same as that at Paxton, aggravated somewhat by a considerable amount of silt in suspension in the water as it reaches the well.

Reduced Inflow Common

Reduced inflow, such as was encountered at these two stations, is not uncommon, for almost all ground waters contain dissolved solids, which display a marked tendency to precipitate in minute amounts as they approach and enter the well, to form a deposit of hard scale on the well screen and in the channels through which the water flows to reach the well. While these deposits form slowly, in the course of time the scale builds up until it not only affects the well screen, but also begins to fill and thus restrict the waterways through which the water reaches the well. When the water carries silt in suspension, it may shorten the period required to close the water passages.

To remove this scale and restore the productivity of wells that are failing by reason of blocked screens, for many years water-service men have followed the practice of cleaning the screens with hydrochloric acid, using various concentrations from full strength to a dilution of 50 per cent or more. In some cases this treatment has been highly successful; in others, the results have been disappointing. One of the important reasons for this, although not the only one, is that different waters carry different salts in solution, for which reason the composition and character of the scale may differ within wide limits.

Some of these scale-forming substances are attacked easily and destroyed by the acid; others are resistant to the point of complete inertness to it. In other cases, the

water may carry one type of solid in solution at one time and some other at another time, depositing them in alternate layers. If some of these scaling substances are resistant to the acid while others are not, the treatment may be partially successful but unsatisfactory. In addition, it occurs not infrequently that considerable damage is done by the acid to the well casing, the drop pipe and the screen.

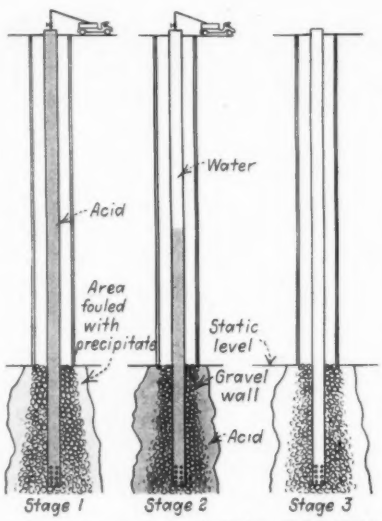
When the well at Pesotum was constructed, clay and various mixtures of clay, sand and gravel, and of shale and gravel were encountered to a depth of 205 ft. From this point the well passed through 3 ft. of rock and 6 ft. of clay into 14 ft. of sand and 30 ft. of gravel. Both of these latter strata contained water, as did the 44-ft. stratum of fine gravel and clay overlying the rock. A 13-in. screen, 65 ft. long, was introduced into the well to tap both the stratum above the rock and the lower two strata in the well. The water rose to a static level of 160 ft., yet, despite the thickness of the water-bearing strata and the apparent head, the original capacity of the well was only 161.5 gal. per min., and this decreased gradually with use.

By 1928, production from this well had decreased to 42 g.p.m., and 800 gal. of hydrochloric was introduced into the screen by means of a 1½-in. pipe. This treatment increased the inflow to 125 g.p.m., but five years later, and again in 1937, production had decreased to 50 g.p.m. In each of these later years, the inflow was increased to 110 g.p.m. by swabbing the inside of the screen with a wooden plunger and by pumping and bailing.

The two wells at Paxton were drilled to hardpan, which was reached at a depth of 147 ft. in well No. 1, and at 159 ft. in well No. 2. Above this hardpan is a stratum of packed fine sand 26 ft. thick in well No. 1, and 51 ft. thick in well No. 2. In the construction of the wells, 26-in. pit casing was put down to a depth of 86 ft. in each well. Inside these, 16-in. well casings were lowered to 109 and 111 ft. respectively. Below these casings 38 ft. of 16-in. screen was placed, except that in well No. 1 there is also 5 ft. of 13-in. screen below the larger one. Both wells are of the gravel-wall type and have never given any trouble from sand or silt.

In the capacity tests made at the time of construction, the north or No. 1 well delivered 361 g.p.m., and the south well 326 g.p.m. For several years there was no diminution in the flow in either well, but eventually production began to diminish until, during the capacity test immediately preceding the acidizing operation, it was only 65 g.p.m. for each well, or about 20 per cent of the original capacity. However, no previous attempt had been made to rejuvenate these wells.

In view of the marked reduction in the delivery from the wells at both Paxton and Pesotum, it was decided to clean the screens for the purpose of restoring production. It was first proposed to do the work with company forces, using straight hydrochloric acid, as was done at Pesotum in 1928. However, after investigating the method of doing the work proposed by Dowell, Inc., arrangements were made for this company to do the cleaning.



Stage 1 Shows the Well Being Filled With Acid; Stage 2—Forcing the Acid Out Into the Formation With Water; and Stage 3—the Well After the Treatment Has Been Completed

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The acid was prepared at the company's district headquarters at Salem, Ill., and hauled to the points of use in a tank truck specially designed for this service. A total of 800 gal. of the inhibited acid was introduced into the well at Pesotum, the application being made between the drop line and the casing. The time required to deliver the acid was 11 min. At Paxton, 600 gal. of the inhibited acid was placed in each well, the time of application being 7 min. and 6 min. for the north and south wells, respectively. In this case, however, the applications were made through the drop lines.

Acid Dispersed with Water

As soon as the acid was applied, water was run into the wells, 500 gal. at Pesotum and 400 gal. in each of the wells at Paxton, to disperse the acid into the formation for some distance outside the screen and dissolve the mineral deposits in the waterways leading to the screen, as well as the scale on the screen itself.

The acid was allowed to remain undisturbed in the wells for 24 hours. At the end of this period it was pumped out and a pumping test was then begun to determine the results of the treatment. During the first three hours of the test at Pesotum, a considerable quantity of fine sand entered the well, but was carried out by the pump. This inflow ceased at the end of three hours, however, and has not been repeated since. No sand entered either well at Paxton during the test or thereafter, as a result of the treatment, despite the fact that the water comes from a fine-sand formation, for the wells are of the gravel-wall type.

While it was not expected that treatment would restore any of the wells to their original capacity, for all experience is to the contrary, the results at Pesotum were somewhat disappointing, for the productivity in this well was increased only 15 g.p.m., from 30 gal. to 45. This is not attributed to any lack of efficacy of the treatment, however, but to conditions within the well itself, as it has always been a "poor" well which has given trouble, despite the light draft made upon it. This is evident by the fact that this is the fourth attempt at restoration in the 23 years of its existence.

At Paxton, the delivery from the north well was increased from 65 g.p.m., to 135 g.p.m., or more than 100 per cent; and that from the south well from 65 to 99 g.p.m., or slightly more than 50 per cent. While this production is smaller than that of the original wells, it is considered quite satisfactory in view of the draft that is being made upon them and the character of the formation from which the water is obtained.

Salt-Treated Timber Has Wide Applications

The Frame Portion of This Enginehouse and the Passenger Platform Shown Are of Timber Treated With Chromated Zinc Chloride

TIMBER treated with chromated zinc chloride is now being used extensively on the Pennsylvania in the construction of certain types of new buildings and in making repairs and renewals in existing structures. This is attributable in part to the fact that this preservative is a salt that leaves the surface of the wood in a clean, paintable condition, and in part to its property of imparting to the wood a considerable degree of resistance to fire.

Because of these characteristics, the Pennsylvania has found that the preservative has special advantages for certain applications that fall generally into four classifications, namely, (1) preservation of the wood against decay; (2) in such places as passenger and freight platforms where, if the timber decking is to be treated, it is desirable that a clean preservative be used; (3) where a clean surface is required that can be painted; and (4) in such structures as enginehouses where the presence of a fire hazard makes it desirable to use a preservative with fire-resistant qualities.

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The use of timber treated with chromated zinc chloride in floors and platforms on the Pennsylvania had its inception several years ago when the railroad was searching for an effective wood preservative for use at such locations that would not have an adverse effect on the natural surface of the wood; that is, one that would not present a slippery surface, cause damage to lading, present a hazard to health, or be objectionable to passengers. Experience with this salt having demonstrated that it fulfilled these requirements, its use on the Pennsylvania in treating timber for floors and platform decking has grown steadily in recent years. This applies only to the decking; the practice is to use creosoted material for all substructure members, such as sills, posts and joists.

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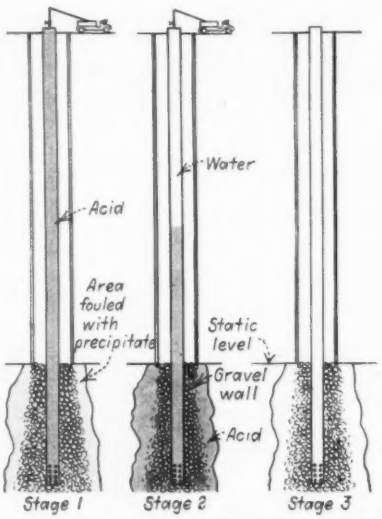

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when the platform decking was renewed some time ago. Despite the difficult conditions that prevail at this location, the salt-treated material is said to be rendering highly satisfactory service.

In Enginehouses

The use of salt-treated timber in enginehouses on the Pennsylvania has an interesting background. Most enginehouses on this road embody timber-frame roof construction, and for many years it has been the practice, in constructing new enginehouses, to employ what is known as "slow-burning" construction as a means of reducing the fire hazard. In this type of construction, relatively heavy supporting timbers are used so that the spaces between them will be as wide as practicable. Specifically, no supporting timbers with any dimension less than 6 in. are used in this type of construction.

A Salt-Treated Platform in the Sunnyside Coach Cleaning Yard of the Pennsylvania at Long Island City, N.Y.

However, it was recognized that, even with the slow-burning construction, the fire-resistant qualities of the timber-framing in enginehouses still left much to be desired. Being, therefore, on the alert for expedients for reducing the fire hazard in such structures, the railroad investigated the possibilities of chromated zinc chloride, which tests had shown to have fire-resistant qualities. Consideration was also given the fact that timber treated with this preservative retains its natural texture and, hence, can be readily painted if this is desirable. It was concluded that the treatment with chromated zinc chloride of timbers used in enginehouse framing would have a number of definite advantages for this work.

The first large-scale application of the preservative for this purpose was made in a 30-stall enginehouse that was built at Harrisburg, Pa., in 1937. In this structure, which has brick walls and concrete foundations, floors and pits, the entire roof-supporting structure is of timber construction, and all members, including the roof sheathing, are treated with chromated zinc chloride. Briefly, the construction includes 12-in. by 12-in. posts, with 6-in. by 8-in. and 6-in. by 10-in. knee braces, supporting roof beams of the same dimensions, which, in turn, carry 6-in. by 12-in. joists. Approximately this same construction is carried into a continuous monitor which covers two bays of the structure. All the wood in this building consists of southern yellow pine. There are approximately 500,000 board feet of timber treated with chromated zinc chloride in this enginehouse.

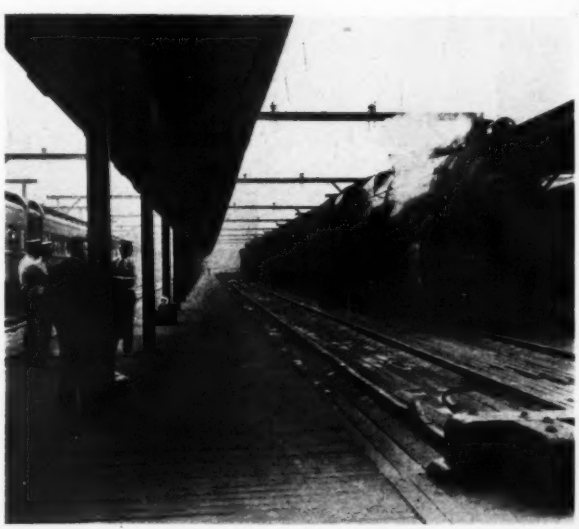
Large Fire Emphasizes Need

Several years ago the destruction by fire of the company's 12-stall enginehouse at Oil City, Pa., emphasized the need for fire-resistant construction in enginehouses. Following this fire, it became the practice to use timber treated with chromated zinc chloride by the Rueping process with final retention of ¾-lb. of dry salt per cubic foot in new construction or renewals in enginehouses and similar buildings. Three of the stalls of the Oil City enginehouse were hurriedly rebuilt immediately following the fire, and due to the time element, it was necessary to use untreated timber in this portion. However, timber treated with chromated zinc chloride was used throughout the other nine stalls.

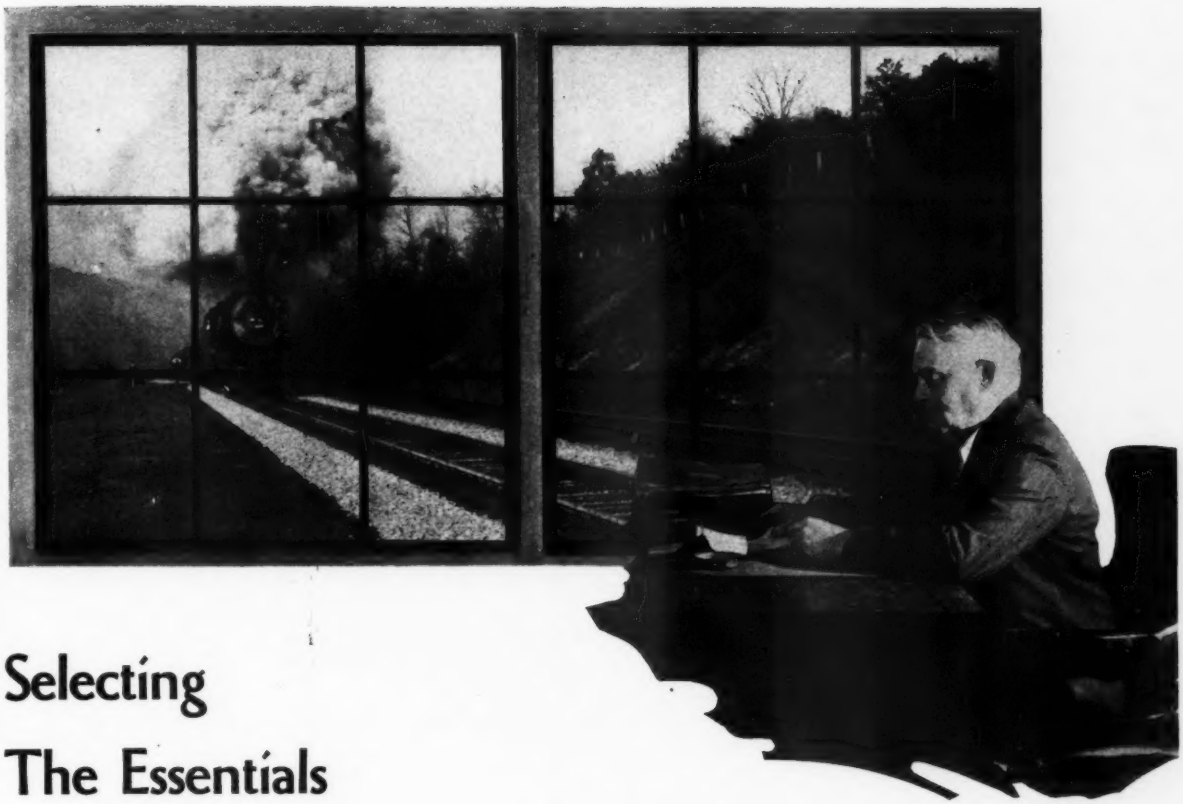
Recent Example

A more recent example of the use of timber treated with this preservative in enginehouse construction is afforded by a project in which 12 stalls in the 43-stall enginehouse at Enola, Pa., were extended 20 ft.—from 120 to 140 ft. In the lengthened stalls the new construction consists essentially of 6-in. by 12-in. roof joists, carrying 2-in. sheathing, which span between the outer circle wall at one end and steel beams at the other. This project entailed the use of about 41,300 board feet of timber treated with chromated zinc chloride.

It is not the practice on the Pennsylvania to carry salt-treated timber in stock but to acquire it as needed for specific undertakings. Projects involving new construction are generally performed under contract, and in such cases the acquisition of the necessary salt-treated timber is handled by the contractor. Where timber so treated is needed for renewal or repair work, which is performed by company forces, it is acquired direct from timber-preserving companies on the basis of competitive bids. Wherever possible, the timber is framed and cut to size before treatment.



A Chromated Zinc Chloride Treated Platform at the Road's Broad Street Terminal, Philadelphia, Pa.



Selecting The Essentials For Track Maintenance in 1943*

By E. C. Vandenburgh

Engineer of Maintenance,
Chicago & North Western, Chicago

"Maintenance men are faced with serious problems and great responsibilities during the coming year," says Mr. Vandenburgh. He discusses what measures should be taken to maintain tracks and other facilities to serve the war traffic in the face of a continued shortage of critical materials and an increasingly serious shortage of labor

MANY of you have probably seen the joint London-Washington official statement that "Transportation will constitute the major problem of the United Nations." The railroads are definitely a war agency and it is the duty of railroad men to see to it that they continue to function. There are no bottlenecks on the railways today. This record must be maintained for the duration. It is a matter of vital necessity that adequate service be maintained, not to serve civilian traffic, but to serve the war traffic. That necessity makes it imperative that every hour of labor and every pound of material be directed in a way to secure the maximum benefit therefrom.

In the light of this situation, maintenance men are confronted with serious problems and great responsibilities and, under the most favorable circumstances that can be foreseen for 1943, they must be prepared to get along on a mere subsistence basis in order that the materials needed for the war effort can be supplied to the armed forces.

Unprecedented Traffic

During the last twelve months, railroad tracks, particularly on the main arteries of traffic, have been required to carry an unprecedented tonnage at higher speeds than ever before. Although there has been some reduction recently in passenger train speeds between terminals, this has had little effect on their speed on open track, the additional time being consumed in station stops due to the greater volume of traffic. No reduction has been made in freight train speeds, nor can we expect any in 1943. We all know that high speeds induce greater stresses in the track structure, creating the need for heavier construction or for additional labor to maintain the existing construction adequately. Therefore, we are confronted with the necessity of maintaining track in as good condition as we have in the past. To do this under the conditions now confronting us will require all of the energy and resourcefulness of our maintenance organizations, and the elimination of all non-essentials from our program.

The first, and by all means the

*Abstract of an address presented before the Maintenance of Way Club of Chicago, on December 21, 1942.

most important essential of every maintenance organization, is to keep the tracks suitable for safe and efficient operation, and this, in the face of the existing material and labor shortages, which certainly will not be alleviated during the coming year, is the crux of the problem. Due to the wide variations in the physical condition of different properties following ten years of depression, with curtailed expenditures for maintenance purposes, there is a variance in their essential needs, particularly as measured by pre-war standards. Now, however, we must forget the things that seem desirable, eliminate any thought of "nickel plating," and adhere only to the basic fact that railroad trackage is a structure designed and built for the safe and speedy movement of trains. We must eliminate many of the differences in standards and specifications of the past, thus furthering the conservation of materials and labor in the railroad supply industry. The American Railway Engineering Association has made great strides in this regard during the past year and we must be prepared to accept its judgment.

We can well heed the admonition of David P. Beech, assistant chief of the Maintenance Equipment section, Transportation branch of the War Production Board, speaking before the annual meeting of the American Railway Bridge and Building Association recently in Chicago, who said: "The job right now is to see that the railroads function properly and are maintained with a minimum amount of strategic materials. The common problem is to maintain facilities on an absolute minimum basis in order to make available for urgent expansion purposes a portion of the critical materials that can be allotted to the railways."

Rail

The fundamental materials required in the consruction of track are few but they are vital. First of all, we are confronted with the problem of rail, including the fittings and accessories necessary to a rail program, such as joint bars, bolts, spikes, tie plates, turnouts and other materials. Because of financial restrictions, most roads purchased only limited amounts of rail between 1930 and 1941. This year only limited quantities were available, which were distributed in as equitable a manner as possible by the War Production Board, giving due weight to the requirements of war traffic. This has resulted in a definite shortage of rail generally, and this shortage will continue throughout the war. It is, therefore, essential that careful consideration be given to the locations where such quantities of new rail as may be available, are to be laid. The changes in the routing of traffic due to the war, occasioned by the construction of industrial plants for war work, the development of new natural resources and the increased volume of existing ones, must be considered as well as the condition of the rail, such as wear, age, deterioration, too light section, riding condition, etc., which has governed in the past.

The same factors govern the re-use of the old rail which is removed when the new rail is laid. Possibly the cropping of such rail, with a resultant loss of material and an expenditure for labor and transportation, can be avoided, by repairing the battered condition of the rail ends. Joint bars may be repaired by reforming and worn tie plates may be made available for lighter traffic lines by repunching. One road, I am informed, and there may be others, is giving consideration to the re-conditioning of track spikes by reforming. There are many uses of available material which can be developed to overcome the dearth of new material.

Ties

Another factor which is wholly as essential as rail, and which will become increasingly important, is the tie problem. There is already a very definite scarcity of track and switch ties and their production is on the down grade. The Office of Price Administration placed a ceiling on tie prices which is too low to keep the producers in the woods. Output in this highly specialized industry has decreased as much as 65 per cent in areas of normally large production due to the price ceiling and to a widespread loss of labor, occasioned by military needs and higher rates of pay prevailing in other industries. Because of the time that is required to cut, manufacture, transport, season and treat ties, the full effect of this situation will not be felt in 1943, but the outlook for 1944 is very bad.

It is, therefore, essential that the greatest economy be exercised in the use of ties during the coming season and that rigid control be established. Their use should be restricted insofar as possible to the heavy traffic lines where a greater part of the tonnage is handled and as few renewals as possible made on less important branch lines. Usable ties from abandoned lines and tracks should be salvaged, even though this may be uneconomical. Such ties should be reinstalled as soon as possible to prevent deterioration and to conserve new ties.

The removal of ties should be carefully scrutinized to make sure that the maximum life has been obtained from every tie. Ties which are very poor can often be left safely in main tracks if the ties immediately adjacent on either side are first-class. Some ties removed from main tracks may be suitable for re-use in little-used side tracks. I recommend for perusal an article on the Better Utilization of Ties that appeared in the December issue of *Railway Engineering and Maintenance*, which deals with this subject in a competent manner.

Ballast

The ballast program must also be given thorough consideration. Although the raw materials may be readily available, the shortage of cars, locomotives and labor makes good judgment necessary in the application of ballast. Such ballast as may be available should be definitely restricted to the lines subjected to heavy traffic, which are taking a terrific beating. The lighter traffic slower-speed lines must be taken care of without additional material and with a minimum of labor until after the war. Much can be accomplished with a relatively small amount of labor by the use of ballast cleaners and ballast scarifiers in restoring the usefulness of existing ballast, thus reducing the critical labor factor.

While not strictly a maintenance item, the construction of passing tracks and tracks to serve industries which may or may not be connected with the war effort usually devolves on the maintenance department. They are called upon to furnish the track materials required and should have sufficient reserve to take care of such demands. If they do not, it may be necessary to remove little-used trackage to secure the necessary material. Further, they are called upon to furnish the organization, tools and labor to carry out the track work in most cases. It is, therefore, essential that they be prepared to meet such demands. That such demands are not a minor item, may be gathered from the fact that 8,000 miles of track were built in this country in 1942 to serve industrial expansion for the war.

The Labor Problem

During the last working season in the Middle Western area the labor problem was not acute, although it was very serious in some other parts of the country, particularly in the Far West and Southwest, and it was definitely felt in the Middle West during the last 6 or 8 weeks of the working season. The labor problem will, I feel, be the greatest problem of 1943.

"Roadmasters and Supervisors Should Make Every Effort to Procure Maximum Production—and Unproductive Work Must Be Eliminated"

The available supply must be used primarily on the high-speed heavy-traffic lines essential to the transportation of troops and war materials and the fullest utilization must be made of all available labor, even though economy must be sacrificed to a certain extent, particularly in the matter of overtime. Roadmasters and supervisors should make every effort to procure maximum production from the labor available and unproductive work must be eliminated. To this end close supervision and frequent contacts with the foremen are necessary to know what they are doing and that there is no waste of material.

The only bright spot in the labor situation is the fact that, to a great extent, we have been able to retain our experienced foremen, which gives us a wonderful nucleus with which to carry on. I expect to see an extensive use of youths of high school age for track labor, as I believe they are more adaptable and will give better results than other suggested sources of supply. They will present an entirely different problem in supervision for the foreman, to which he must adapt himself. Precautions for their safety must be given marked attention, as they do not have knowledge of or appreciate the hazards of track work.

Some roads are reported to be using women successfully for track work. It is my belief that their use should be confined to work as crossing flagmen and possibly for certain work around terminals. The personal problems involved and laws governing their employment seem to make their general use undesirable. I suggest that other expedients be developed. One road has had success during the past season in advertising for labor in local newspapers along its lines. To a degree that is seldom appreciated, local foremen and supervisors can do more to solve this problem than anyone else, if given encouragement and authority. The picking-up of an isolated man here and there will be a definite contribution. Regular track forces should be stabilized this winter at a higher level than usual, in order to have them available in the spring and the spring work should be started as early as climatic conditions will permit, to secure the longest possible working season.

Work Equipment

The use of labor-saving machinery must be carefully programmed and assigned in a manner calculated to obtain the maximum benefit. There will be a great need for additional machinery of this type during the coming working season, and, although there will be difficulties in procuring it, this should not deter us from making the effort. The railroad supply industry, in spite of many difficulties, furnished almost as many units to the railroads in 1942 that were supplied in 1941, and it is reasonable to believe that they will accomplish no less in 1943.

The situation with respect to bridges and buildings, coal chutes, water stations, docks and wharves, is serious. Practically all of the materials that enter into the reconstruction or maintenance of such facilities are "critical." For that reason, the reconstruction of such facilities should be eliminated, insofar as possible. Repairs rather than reconstruction, even though they may be economically unjustified, should be made if they require less critical materials and labor. Substitute materials which are noncritical may be used. Needed materials, which are unobtainable in the usual markets, may be found locally in the stock of yards and warehouses in the smaller towns, and this is another place where local employees can be of marked assistance. Ingenuity should be exercised in the use of such materials as may be available, to avoid procurement of new materials. The same consideration is applicable to the maintenance of signal, electrical, telephone and telegraph facilities.

Many of the projects usually associated with track maintenance must be foregone until after the war, even though distinct economies may be derived therefrom. Even if the needed materials are procurable, track drainage, of which I am highly in favor, cannot be justified except in extreme cases involving slow orders. Bank widening and stabilization of cuts and fills must be deferred unless conditions as definitely interfering with the free movement of traffic. Repairs to fencing, particularly where critical materials are involved, and likewise, repairs to or the construction of highway and farm crossings must only be made when absolutely necessary. The cutting of weeds and brush on the right of way must be minimized to the greatest extent possible. There is a field here for diplomatic conferences with local weed control authorities to secure some relaxation in their demands in order that we may conserve man-hours for track work. Oiling of the roadbed should be restricted to conserve both oil and labor. Little should be done for appearance.

On the other hand, special track work such as frogs, switches, railway crossings, track fastenings and similar material must be maintained to secure its maximum service life. Rail should be transposed on curves before it is worn to such an extent that transposition is impracticable. The use of rail and flange lubricators will definitely increase the life of rail. Bolts must be kept tight. The use of reformed angle bars with the requisite amount of overfill, or of rail joint shims, and the building-up of rail ends, or both, will keep rail in a serviceable condition if rails for replacement are unobtainable.

Following the old adage that "A stitch in time saves nine," the repair of unsatisfactory conditions should be made promptly to avoid the greater expenditure of material and labor which would be required if marked deterioration were allowed to develop. Careful consideration should be given the necessity for daily track inspections on lines of light traffic.

In the past, programming of work has been recognized as highly desirable as a measure of economy. Today it is even more important, not from the point of view of economy, but primarily to assure that the most essential work, the work which will actually further the war effort, is done first. We are not going to have all of the material and all of the labor we want, but after many years experience with maintenance men, I firmly believe that we can accomplish the real essential. This is to maintain track in good alignment, gage, surface and cross level, upon which we can keep the trains rolling.

OLD TURNTABLES Get New Lease on Life

Materials for Victory

No. 7 of a Series

To adapt old balanced-type turntables to the increasingly rigorous operating conditions that prevail under today's war-time conditions, while employing an insignificant amount of new steel, the Canadian National is converting these tables into structures of the three-point bearing type. The details of how this is done, for which we are indebted to C. P. Disney, bridge engineer, Central region, are given in this article

BY MEANS of the relatively simple and inexpensive expedient of converting its balanced-type turntables into units of the three-point-bearing type, the Central region of the Canadian National is making it possible to continue these turntables in service for handling the heavier and longer power that is in general use on this road today. Not only is the necessity for installing new turntables, with the consequent greater cost, avoided thereby, but the fact that the expedient adopted reduces the need for new steel to an insignificant amount constitutes an appreciable contribution to the Canadian war effort. Present plans call for the ultimate conversion of all main-line turntables, of which three have already been converted.

Nature of Difficulties

There are still a considerable number of turntables of the balanced type in service on the Central region of the Canadian National, which were installed upwards of thirty years ago. With the introduction on this road in recent years of modern types of locomotives, with their heavier wheel loads and greater lengths, the company began to experience difficulties with these older turntables. To handle the longer power, many of the tables were lengthened, but this did not solve the difficulties that were being experienced as a result of the fact that they were being called on to carry heavier and longer locomotives.

When balanced-type turntables are not under load, the wheels of the end trucks clear the circle rails by small amounts, usually about an inch or slightly more. When a locomotive moves onto such a turntable, and is centered thereon, a deflection occurs, causing the wheels to come almost into contact with the circle rail. Obviously, when the weight of the locomotives being handled is increased, the amount of the deflection shows a proportionate increase, thereby causing the wheels to bear against the circle rail. On the Canadian National, it frequently happened that this caused the race wheels to become bound in position while a locomotive was being turned, especially if there were surface irregularities in the circle rail. To overcome this difficulty, it became necessary to shim up the turntables at the center bearings sufficiently to relieve the pressure between the race wheels and the circle rail.

However, the practice of shimming has adverse effects. It is frequently necessary to turn "dead" locomotives and cars, and to do this another engine is used to draw the unit to be turned onto the turntable. If this is done on a balanced-type turntable, the live locomotive, in passing across the structure, causes it to tilt and to bear on the circle rail at one end so that the receiving end of the turntable projects several inches above the approach rails. It has been the experience on the Canadian National that, in moving onto the table, the wheels of the "dead" locomotive strike these up-raised rail ends, thereby imparting a severe shock to both the turntable and the engine. Obviously, the more the turntable has been shimmed, the greater is the extent of the tipping action, and, in turn, the severity of the blow. It has also been the experience on this road that the tipping action that occurs whenever a locomotive moves onto a balanced-type turntable that has been shimmed causes more or less severe impacts to be suffered by the end race wheels and the center casting—in fact, the whole table. Also, the force of such impacts becomes greater as the weight of the locomotives is increased.

Conversion Is Tested

As the heavier units of motive power came into more general use, the difficulties enumerated above became so troublesome on the Central region that considerable thought was given to the possibility of overcoming them. As a means of accomplishing this end, the conversion of the turntables into structures of the three-point-bearing type seemed to offer possibilities, and to try out this expedient the turntable at Stratford, Ont., was converted in 1928. As this table has since given satisfactory service, it was decided several years ago to undertake the conversion of a number of additional units at other terminals.

The first turntable to be converted in this program was at the engine terminal at Turcot (Montreal), Que., where the change was made in 1939. Subsequently, the turntables at Capreol, Ont., and Hornpayne have been converted. Additional conversions are being carried out as rapidly as possible. Incidentally, the turntable at Turcot affords an outstanding example of what can be accomplished by this method of conversion. This is a through-girder structure, 100 ft. long. Serving a 57-stall enginehouse at the busiest terminal on the road, it handles an average of 375 movements daily, including some of the heaviest engines in service on the Canadian National. This turntable was installed in 1905, and its continuance in service under these severe operating conditions was made possible only by

Converted in 1939, This 37-Year Old Turntable at Turcot (Montreal), Que., Is Today Turning An Average of 375 Locomotives in Each 24-Hr. Period

A Portion of the Circle Wall at Turcot, Showing the Manner in Which the Circle Rail is Supported on Plates Anchored Directly to the Concrete

converting it to a three-point-bearing structure.

Essentially, the conversion of a balanced-type turntable into a three-point-bearing type is simply a matter of lowering it until the race wheels at the ends are brought to bear fully on the circle rail when the structure is not under load. Obviously, this causes a greater proportion of the load to be taken by the end race wheels. Hence, since the race wheels of the balanced-type turntables on the Canadian National are of relatively light construction, they do not have the necessary structural strength; neither do they develop the required degree of efficiency to render satisfactory service under the loads imposed when a turntable has been converted.

Special Wheel Assemblies

Therefore, the main part of the work of conversion consists of replacing the existing end race wheels with roller-bearing assemblies designed especially for this service. These are heavy-duty single-wheel assemblies, and, as a special feature, the wheels have removable high-tempered steel tires that can be replaced readily when they become badly worn. When converting a turntable, the existing race wheels are removed and one of these single-wheel assemblies is installed at each corner of the structure, that is, two at each end. They are so designed that they can be installed by bolting them to the lower flanges of the end floor beams.

To convert a turntable, it is first lowered the necessary amount to make the rails on the approach tracks and the rails on the turntable flush with each other, this usually being accomplished by simply removing the shims in the center bearing. The existing race wheels are then removed and replaced with the new roller-bearing assemblies, which are so installed that they bear on the circle rail at all times. The nature of the work of conversion is such that it can usually be done under traffic with a minimum of interference with turntable operation.

Existing Motors Suffice

In general, the balanced-type turntables on the Canadian National have 15- or 20-hp. traction motors, supplemented in some cases with air motors, and it has been found that these usually have sufficient power to operate the turntables after conversion. The most important factor in making this possible is the high efficiency of the roller-bearing race wheels. Another consideration is that emphasis is placed on the necessity of providing a substantial foundation for the circle rail. To this end it is the practice to employ concrete circle walls on which the circle rails are supported directly by means of malleable iron plates or chairs. Each of these plates is 1-in. by 6½-in. by 1-ft. 5-in. in dimensions and is held down by four 1-in. bolts cast into the concrete, the upper ends of which are fitted with spring washers and square nuts. At each of these plates, two rail clips engage the base of the rail, each held down by a square nut, with spring washer, on a 1-in. by 3½-in. bolt, the head of which is countersunk in the base of the plate. In general, 100-lb. circle rails are used.

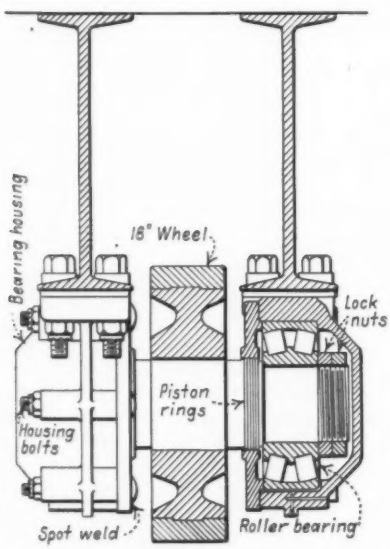
By converting its balanced-type turntables, as described in the foregoing, the Central region of the Canadian National is realizing a number of advantages. In the first place, the shocks and impacts to which the tables are subjected in regular service are greatly reduced, thereby prolonging the lives of the structures and reducing the need for maintenance and repairs, while at the same time obtaining better and more reliable performance. Moreover, since it is not necessary to spot engines on three-point-bearing turntables in such a manner that the center of gravity is at the center of the table, as in the

case of balanced structures, one effect of conversion is to make it possible to turn longer locomotives without actually lengthening the turntable.

Changes in Floor Systems

In addition to, but apart from, its policy of converting its older turntables to the three-point-bearing type to adapt them to the handling of modern types of power, the Central region has also found it necessary to strengthen the floor systems in certain of them. These structures are generally of the through-girder type, and originally the floor systems were of relatively light construction, with the rails supported on 8-in. by 16-in. timbers spanning between shelf angles fastened directly to the webs of the girders. Later on, this type of floor system was replaced in existing turntables with a form of construction consisting of floor beams of 30-in. 116-lb. wide-flange beams supporting two lines of stringers of 24-in. 80-lb. I-beams, spaced 7 ft. apart.

More recently it has been the practice to improve on this latter construction by relocating the stringers to five-foot centers so that the rails can be supported directly on their top flanges, thereby eliminating the



This Drawing, Including Partial Section, Shows Details of the Special Single-Wheel End Trucks That Are Installed When Turntables Are Converted

ties. In this form of construction the effective depth of the stringers is increased by an appreciable amount, with the result that the stiffness of the floor system is enhanced considerably. With this latter construction it is generally the practice to insert a 15-in. channel, with the legs pointing upward, between each rail and its supporting stringer, to provide a safeguard in the event that a derailment should occur.

By converting its balanced turntables to the three-point-bearing type, as described in this article, the Central region is saving the many thousands of dollars that it would have been necessary to spend if the usual procedure had been followed of scrapping the old turntables and replacing them with new structures. In addition, and of equal importance in these days of war-time material shortages, the need for substantial quantities of new steel is avoided; thereby a measurable contribution is made to the war effort. The work of converting the turntables is under the direction of C. P. Disney, bridge engineer, who originated the idea involved and developed the methods used; B. W. Wheelwright, chief engineer; and F. L. C. Bond, vice-president and general manager—all of the Central region.

$10,270,000 for Work Equipment

(Continued from page 37)

Union Terminal
1 Motor car, inspection

Unity
1 Motor car, section

Utah
1 Bolt tightener
1 Grinder, rail, portable
1 Motor car, section
1 Spike driver

Ventura County
1 Motor car, section

Virginia Blue Ridge
1 Motor car, inspection
2 Motor cars, section
1 Motor car engine
2 Motor trucks

Virginian
1 Motor car, inspection
2 Motor cars, section
1 Push car, heavy duty

Wabash
18 Tie tampers, unit type
1 Tie tamping outfit
1 Weed burner

Western Maryland
1 Dump car
2 Grinders, rail, portable
1 Motor car, inspection
1 Motor car, section
6 Motor trucks
7 Rail and flange lubricators
8 Tie tamping outfits
1 Wood worker

Western Pacific
4 Air compressors
2 Generators, portable
2 Motor trucks
1 Paint spraying outfit
2 Pumps, portable
11 Rail and flange lubricators
16 Tie tampers, unit type

Wheeling & Lake Erie
1 Hammer, pile driving
6 Motor cars, section
2 Motor trucks
1 Power unit
24 Push cars

CANADA

Alma & Jonquieres
2 Concrete vibrators
1 Motor car, section

Canadian Pacific Lines
A-Canadian Pacific
4 Air compressors
1 Bucket, clamshell
2 Concrete mixers
6 Cranes
1 Discer
2 Drills, rail
1 Engine, gas driven, for welding outfit
1 Engine, Diesel, for welding outfit
2 Generators, portable
2 Generators, for welding outfit
3 Grinders, rail, rail mounted
8 Grinders, rail, portable
160 Hand cars
36 Motor cars, inspection
1 Motor car engine
46 Motor car frames
1 Mowing machine
1 Paint spraying outfit
2 Pumps, portable
102 Push cars
15 Rail and flange lubricators
2 Saws, rail
1 Power shovel, combination crane-dragline
2 Velocipedes
4 Weed killer, spraymotors for
1 Welding outfit
B-Dominion Atlantic
8 Rail and flange lubricators

Newfoundland
4 Air compressors
2 Bolt tighteners
1 Concrete mixer
2 Cranes, crawler mounted
1 Crane, wrecking
2 Drills, rail
2 Grinders, rail, portable
4 Jackhamers
6 Motor car engines
1 Pile driver
1 Pump, portable
2 Shovels, power
24 Tie tampers, unit type
3 Wood borers
2 Wrenches, impact

Northern Alberta
1 Mowing machine

Temiskaming & Northern Ontario
1 Grinder, rail, portable
1 Hammer, gasoline
1 Motor car, inspection
7 Rail and flange lubricators
2 Tie tampers, unit type
1 Tie tamping outfit

Toronto, Hamilton & Buffalo
1 Motor car, section

MEXICO

National Railways of Mexico
1 Bulldozer
5 Draglines
1 Motor driven grader
1 Scraper
2 Tractors

What's the ANSWER?

Releasing Revenue Cars

In view of the extreme demand for cars, what measures can be taken to insure the prompt release of revenue cars containing company material? Of specially assigned cars?

Can Not Be Condoned

By G. S. Crites
Division Engineer, Baltimore & Ohio, Punxsutawney, Pa.

The first thing to do towards releasing company material from much-needed cars is to get the urge. This urge should be uncontrollable when it is realized that 1 car in every 25 is either moving or standing with a load of company material. If any man who is responsible for the release of company material from cars does not have this urge, drastic methods should be employed until he is thoroughly and completely saturated with it. It is true that this material must be sent to the point or points where it is needed, to prevent failure of railway transportation, but any unnecessary delay of cars containing company material that are needed so desperately in our war effort, cannot be condoned.

Cars, whether they be revenue or assigned, should not be loaded until plans are complete and definite for their handling and for the unloading of the material with the minimum of delay. To do otherwise will not only delay the car or cars, but may cause unnecessary use of motive power, of which there is no surplus at present. An illustration of how this can be worked is shown by arrangements that are made for handling stone ballast on a railway that serves a group of coal mines that do not work on Saturdays.

In this case, arrangements are made with the quarry to have the ballast ready for loading on Saturdays. The desired cars are selected and switched together on Friday night. They go to the quarry early on Saturday for loading. The loaded cars move out of the quarry on regular trains and are taken out for unloading early on Monday, on which day power and crews are available for this service. The empties are then returned to the terminal, from which they go to the mines. This arrangement pleases train and enginemen who otherwise might not get out on Mondays. Everyone in the office and on the road gets behind the train movements to facilitate the operation.

Same Attention to Both

By F. W. Biltz
Engineer Maintenance of Way, Reading, Reading, Pa.

Both subjects, that is, the release of revenue cars and the handling of specially-assigned cars, are so intimately related that measures that will insure expeditious handling or release of either one will apply just as effectively to the other. In the first place, it is essential that an adequate supply of specially-assigned or service cars be provided to handle shipments of company materials wherever this is practical. This holds true particularly for ties, storehouse materials, locomotive cinders, rail and fittings, ballast and, as a matter of fact, any manufactured products consigned to the several departments of the railway. It applies also to cars for the use

Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

To Be Answered in March

1. At a time when scrap is needed so urgently, what special measures can be instituted to insure that scrap on the right of way is collected currently? How often should it be shipped? Who should be responsible?

2. On roads that have lowered physical standards and age limits, what precautions should foremen of bridge and building gangs observe with respect to the safety of their men, that have not been necessary heretofore?

3. In view of the shortage of labor, what are the relative advantages and disadvantages of section and extra gangs for routine surfacing? How should they be equipped?

4. What effects do the present shortage in desirable grades of construction timbers have on the requirements for preframing and treatment? Why? To what extent?

5. In what ways can the use of critical materials in track maintenance be reduced? What materials?

6. Where the capacity of pipe lines or sewers has been decreased severely by deposits, what methods are available for cleaning them to avoid the use of critical materials?

7. In view of the extreme need for rail, is it permissible at this time to repair driver-burned rail by welding and keep the rail in service? Under what conditions? What precautions, if any, should be observed?

8. To insure quick restoration of bridges or buildings damaged by sabotage or other enemy action, should emergency stocks of materials be increased? To what extent? Should additional points be established for holding emergency stocks? Why?

of the track, the bridge and building and the signal departments as well as to the transfer of materials between shops and enginehouses.

To insure prompt unloading at destination, all shipments should be covered with bills of lading rather than relying on the ordinary car ticket, with its usual meagre information. Agents should report promptly to the consignee the receipt of all cars containing company material. The stores department and other heavy shippers can sometimes prepare the waybills and thus avoid the loss of time required to transcribe it in the agent's office, which will mean much in expediting matters in the present situation.

Ballast, ties and other bulk materials should be called for only as required, and shipments should be coordinated with the supervisor's program. They should be shipped in quantities that will insure a full day for the work train, and thus avoid the delay occasioned by the practice often indulged in of accumulating enough cars through small shipments to warrant calling a work train.

Clarification of one situation should bring more desirable results than are sometimes attained now. This is the re-education of yard masters, yard conductors, yard clerks and agents who still retain the traditional disregard for cars of company material, and who defer the handling of these cars until an opportune time presents itself. Aside from the importance of handling company material expeditiously from the standpoints of car shortages, the material situation, labor shortages and other difficulties, the present critical situation demands that the same attention be given company material as to revenue shipments.

An accurate record should be maintained in the office of the consignee of car numbers, contents and dates of shipments for all cars on hand or en route, to insure prompt unloading and to avoid the possibility that any car may be overlooked. The importance of co-operation between all departments and particularly between individuals who handle shipments of company material, from the points of loading to those of disposition, can be brought out clearly in considering the availability of specially-assigned service cars. One hundred cars making a round trip every week in company service will perform as much service as 200 cars that require two weeks to make the same round trip. Tight car situations can be alleviated by proper attention on the part of the men who handle the cars.

In the handling of scrap, adequate storage areas should be provided at the shops, as well as at the storehouse scrap docks. Scrap should be stored on the ground, rather than in cars, until shipping instructions have been received. Many roads keep down the number of stores-department cars in transit and at the same time obtain effective handling of materials by making deliveries by "stores" or supply trains, in preference to shipping out cars destined for a half dozen or more points, to be handled by local freights. Other roads are employing automobile trucks to excellent advantage, effecting prompt delivery and relieving yard and road crews from the handling of this tonnage in cars.

Briefly, the problem of handling cars of company material can be simplified by a realization on the part of all departments and employees involved in the operation, of the importance of the shipment; by an adequate supply of service cars; by proper advance notice of all shipments, through the maintenance of an accurate record of all cars on hand and en route, in each office having to do with the release of cars; and by a judicious handling of scrap, ties, ballast and other materials, as outlined.

Changing Inspection Practices

Is it desirable to make changes in the present bridge-inspection practices for the duration of the war? Why? What changes? Are there disadvantages?

Must Be of a High Order

By A. R. Ketterson
Engineer of Bridges, Canadian Pacific, Montreal, Que.

There never has been a time when it has been so necessary to scrutinize our bridge structures so carefully as at this moment. There are several reasons why this is so. For a number of years prior to the beginning of the war we were passing through a depression. Traffic and revenue were well below normal and there was a natural tendency to defer structural repairs when it was believed that actual safety was not endangered. Immediately following this period, we entered a war that has created an unprecedented traffic, both freight and passenger. Train schedules have been shortened to the point where, on many sections of the line, the speed of freight trains approaches or equals the former speed of passenger trains, and the volume of both freight and passenger business has become so heavy that the safety and regularity of the service demand bridge inspection and maintenance of a high order.

Make Them More Intensive

By General Inspector of Bridges

If the inspection of bridges has been organized properly in the past, no change in methods should be necessary. Obviously, however, in view of the record-breaking volume of traffic we are now handling, structures are performing more work than formerly so that they are wearing out faster, while the opportunities for accident or other damage increases as the number of trains and cars passing over them increases. If the bridge inspection has not been well organized in the past, by all means, the practices should be revised so that the structures will receive the attention they deserve.

While the practices do not need revision, provided they have been correct, inspection should be more intensive; that is, the structures should be gone over more frequently, and more carefully; in other words, nothing should be taken for granted. Every member and part, including all connections, should be examined deliberately, not hurriedly or casually. I am a firm believer in specially-assigned division bridge inspectors. Bridge inspection should not be left to the foremen, who generally have a multitude of duties that prevent them from giving this phase of the work the time and detailed attention that bridge inspection deserves.

Inspect Frequently

By W. F. Martens
General Foreman Bridges and Buildings, Atchison, Topeka & Santa Fe, San Bernardino, Cal.

Priorities given to war industries are having consequences which demand that railway bridge forces conserve materials and labor to the greatest possible extent, so that the maximum of new material can be diverted toward the war effort. This can best be accomplished by keeping the materials already in the structures in service as long as possible. This requires that the present bridge inspec-

tion practices be geared to permit the inspection forces to make their inspections at such intervals as will disclose excessive fatigue of materials in time to prevent them from becoming a hazard. Generally, timber gives warning long before it actually fails, and in many cases a surprising amount of service remains in a stick of timber after the first signs of fatigue become evident.

No inspection practice is so effective as one that employs a full-time bridge inspector assigned to a single division, since he becomes thoroughly familiar with all of the structures and acquires a knowledge of the possibilities and limitations of certain kinds of material after it has been in service in any particular structures for a given period. Furthermore, the inspector is given an opportunity to make special and more frequent inspection of those bridges that have reached the end of their usefulness.

While foremen of district and floating bridge gangs should be required to inspect bridges that may need such attention, in the immediate vicinity of where the gang is working, the responsibility for the inspection of the bridges on the entire district should not be delegated to these men, since it will result in great loss of manpower. It should be incumbent on section foremen, however, to make superficial inspections of all bridges near where the gang may be working.

Preventing Machine Failures

What are the most common causes of failure of power machines and tools? What can be done to prevent them?

Supervisor Is Responsible

By G. R. Westcott
Assistant Engineer, Missouri Pacific, St. Louis, Mo.

A few years ago it would have been possible to select certain mechanical features of the few roadway machines in service and say "These are the things that cause failure in operation." This is no longer true, however, except in the case of some new devices in which the weaknesses in design have not yet been discovered and corrected. It is true that some parts are still more likely to give trouble than others, and in the absence of careful handling, frequent and thorough inspection and proper adjustment, they may cause machine failures.

The magneto may be considered typical of these; its failure to function means a power failure and therefore, a machine failure. Assuming a design that is well adapted for the motor to which it is applied, which is not always the case, and assuming further that it is well-built, mechanically, which, unfortunately, is also not always true, the magneto may still fail as its operation is more susceptible to interruption by unfavorable conditions than most of the parts making up the machine. Yet, it can hardly be said that magneto trouble is among the common causes of machine failure, nor does any one of several other mechanical devices common to many roadway machines have this distinction.

The truth is that while machine failures are mechanical in their manifestations, their causes are too often to be found in the conditions of use, and they can best be avoided by proper handling and proper maintenance. These involve a knowledge of the capacity of the machine, avoidance of exceeding that capacity, a knowledge of lubricants and their correct use, a knowledge of the functions of the parts of the machine assembly, and their conditions of wear as determined by frequent and careful inspection. Coupled with careful handling and prompt replacement of worn parts, this knowledge and its application will aid in avoiding failures.

There is a divided responsibility in the use of machines, involving the operator, the maintainer and the supervisor. Unfortunately, the activities of these men are so diverse that close co-operation is difficult. For each of them to have a full appreciation of the things that are necessary for trouble-free operation, calls for more than ordinary consideration of the machine's capacity, its lubrication, its condition and its handling. For each machine, there is a definite capacity beyond which it should not be loaded. If it is well designed by one having knowledge of the work it is to do, it is built with that capacity in view. If not so well designed, a knowledge of its actual capacity is determined by service tests. In emergencies, a temporary overloading or speeding up of the machine may be justified. It should be recognized, however, that such treatment is likely to result in the failure of some part later.

Operators and supervisors are concerned directly to avoid overloading and the maintainer must know the capacity and advise the operator, if it is being exceeded. In most cases, both the operator and maintainer are subject to the direction of the supervisor. In an effort to speed up the work, lacking appreciation of the possible consequences, the latter may issue instructions that will cause a failure and thereby assume the responsibility for it. While the operator is responsible for the lubrication of the machine, he often needs assistance from the supervisor in securing suitable lubricants. Failures because of insufficient or improper lubrication may, therefore, sometimes be chargeable against the supervisor rather than against the operator.

While wear on an exposed part is easily observed, wear on hidden parts can be determined only by symptoms, such as unusual noises, increasing looseness in bearings, heating or, in case of a motor, through loss of power. In every case, judgment is required to determine just when the maximum life of the part has been attained and when its immediate replacement becomes necessary to avoid failure. If the operator conceives that his function is merely that of pulling the levers that control the operation of the machine, and if the maintainer considers that his is only to repair the damage when the machine breaks down, failures will be frequent. On these two men rests the responsibility for seeing that the machine is in good repair and properly adjusted at all times, as well as that the need for repair parts is foreseen and that they are obtained before failure occurs. Despite the most careful inspection, there will be times when conditions will be found that demand immediate action. It is then their added responsibility to make the repairs necessary or, if that cannot be done, to recommend to the supervisor that the machine be taken out of service. The supervisor must then balance the probable cost of the failure against the urgency of the work to determine whether the machine shall be tied up. If it is, he should interest himself in the prompt delivery of the needed parts.

In the foregoing, much responsibility has been placed on the supervisor. It is true that the work being done by the machine is only one of many things demanding his attention and may be of minor importance, compared with other work under his direction. But he should realize that the economies expected from the use of the machine may largely disappear in lost time and expensive repairs by reason of repeated and often unnecessary failures. He should also recog-

nize that his own attitude toward the machine will be likely to be reflected in the work of the operator and maintainer. Failures of machines cannot be avoided entirely, for accidents will happen, parts will sometimes prove defective and mistakes in judgment will be made, but with conscientious co-operation on the part of the supervisor, the maintainer and the operator, they can be expected to remain at the minimum.

A Multitude of Causes

By C. E. Miller
Assistant Engineer of Maintenance, Chicago & North Western, Chicago

This subject is a broad one because of the multiplicity of devices involved and of the large number of causes for their failure. It can be treated only in a general way since the inherent details may vary with the different kinds and types of machines and tools and the service they perform. Furthermore, I understand failure to mean any deficiency of operation, such as failure of the engine to start readily, lack of power, overheating or any other defect that interfers with proper and efficient operation, as well as a complete breakdown.

With the advent of cold weather, it is probable that there will be increased trouble in starting machines that are powered by gasoline engines. This may arise from slow vaporization of the gasoline, ice in the gas line or carburetor or, if the engine has been standing idle for some time, there may be moisture or frost on the spark-plug electrodes, which will need to be dried out. In cold weather, the circulating system must be kept from freezing by means of anti-freeze mixtures or by draining the engines when they are to stand idle for a sufficient time to permit freezing.

When starting in cold weather, the throttle should not be wide open, probably not more than one-quarter open, and the engine, if hand-cranked, should be turned over several times before the ignition switch is closed. A light lubricating oil should be used for winter operation, probably oil having a viscosity corresponding to S.A.E. 20, although some types of engines may use S.A.E. 10.

Hard starting may occur at any season because of fouled or cracked spark plugs, loose or defective wiring, weak battery, worn magneto brushes, worn or stuck breaker points, weak or oil-soaked magnets or a perforated condenser. Hard starting may also be traced to improper gas mixture, obstructed gasoline flow or water in the fuel supply. Again, the tappets may be adjusted improperly, the valve seats poor or there may be a leak at the manifold intake gasket.

If the engine starts but lacks power, the cause may be found in incorrect timing, improper gas mixture, weak or stuck piston rings, a loose governor or throttle, worn valves or worn valve seats. The engine may overheat from various causes, such as the fan belt slipping, the water-pump vane stuck, the radiator or the water hose clogged, lack of oil, or water and oil diluted so that lubrication is not being obtained.

A complete breakdown can generally be traced to lack of attention at the proper time, to abuse, to rough handling or attempting to use the machine for work beyond its capacity. Sometimes they result from defective materials or improper design, but manufacturers of well-established equipment are generally quite active in producing machines of proven design and metallurgy, and the inspection of parts is supervised carefully, so that few defective parts enter the construction of present-day equipment.

As indicated at the beginning, there is such a multiplicity of causes that may result in breakdowns, partial failures or inefficient operation of machines and tools that it is self-evident that for best results this equipment must be looked after by competent mechanics and inspectors, both in the shops and in the field, and the operators should be well instructed and trained in their duties. Frequent inspection by operators will reveal many small details, such as loose bolts or wiring and progressive wear of parts which, if corrected at the proper time, will prevent major failures. The maintenance requirements of such equipment on the railways are not greatly dissimilar to those in our present mechanized army, and we will do well if we note the high degree of training that is being given the mechanics and operators in our armed forces. With such trained personnel, I believe that we will have few cases of failure in equipment of this class.

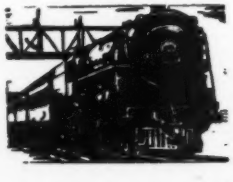
Conserving Switch Points

In what ways can the life of switch points be extended? What precautions should be observed? What are the advantages? The disadvantages?

Grinding One Method

By District Engineer

Switch points wear from abrasion, this being true particularly of the point that diverts the car and locomotive wheels through the turnout. If a large number of wheels are diverted, as at the entrance to a busy yard, at junctions and on ladder tracks, the wear on these points will be rapid. On main tracks, where the traffic generally follows the straight route, and the movements through the turnouts are infrequent, most of the wear occurs on the opposite point. In any event, the wear on the stock rail will be equal to or greater than that on the point. For this reason, if the life of the switch point is to be extended, the stock rail will require as much attention as the point itself. Probably, the most successful, as well as the most common action to conserve the life of switch points is the practice of grinding stock rails and the points to provide a closer fit and better adjustment, and to prevent chipping as the head flattens out from flowing metal.



Provide Better Housing

By Roadmaster

While switch points will wear out in the course of time, despite the most careful conservation measures, better housing and close attention to correct adjustment will do much to extend the life of this part of the turnout. The recent practice of undercutting the stock rail to give more body to the point is a step in the right direction. However, not all switches are made this way, and too often the points are not given the protection against passing wheels that they should have. An incorrectly-bent stock rail will sometimes reduce the life of the point by half.

I like the ground-out housing, since it hides the point completely and, combined with undercutting, will extend its life many times. In some instances, where this form of protection is provided, the point will outlast the stock rail. Guard rails and other

designs of protectors that force the wheel flanges away from the point will also extend its life. At intervals during its period of service grinding will be necessary to remove overflowed metal from the stock rail and assure better adjustment between the stock rail and the point.

Characteristics of Paint

What characteristics of paint will insure the more economical use of both paint and labor?

Ease of Spreading

By R. W. Johnson
Assistant Engineer, Chicago, Milwaukee, St. Paul & Pacific, Chicago

One of the most important characteristics of paint to insure the more economical use of both paint and labor is the ease with which it can be spread and at the same time insure a uniform and durable coating in seasonal temperature ranges of 50 to 60 deg. and in daily ranges of 30 to 40 deg., F. The bridge-painting schedule on the Milwaukee starts the first of May and continues to the first of November. It is not possible, when starting out three or four system bridge-painting gangs to start in the south and work northward in the spring or to reverse this in the fall. Neither is it possible to program the daily work to take advantage of ideal painting temperatures, so that a paint is desirable that can be applied approximately as easily at low as at high temperatures without affecting its quality.

Quick drying without detriment to its protective quality is desirable for bridge paints used in primary and spotting coats, so that labor costs will not be increased by reason of gangs being delayed in applying the top coat where jobs are not large or other work close by is not available.

Quality Fundamental

By Supervisor of Buildings

Durability is the most important characteristic of paint, with respect to economy. Disregarding this for the moment, however, the spreading and covering power of the paint determine how many gallons must be used on a given job, so that these characteristics have a direct effect on the economy of its use. The paint that hides well will go farther than one that does not. Intimately tied up with covering power is the ease with which the paint can be spread, for this affects, favorably or unfavorably, the amount of labor required for its application. If a paint spreads easily, the painter is more likely to maintain a high rate of application throughout the day since he does not tire so quickly.

A large factor in the overall economy of paint is the frequency with which repainting is necessary and the cost of repainting. Some paints wear away slowly and evenly through chalking, so that preparation for repainting involves little more than going over the surface with a stiff brush. Paints that wear less smoothly may require scraping before the surface can be repainted. Other paints mature to a brittle condition and may demand complete removal. In either of the latter two cases the cost of painting will be increased measurably, compared with the smooth-wearing paint.

It will be seen, therefore, that spreadability, hiding power and smooth wear without brittleness are highly important factors in the economy of paint, while they are desirable for other reasons. Yet durability is of still greater importance, for this factor determines the frequency with which the surfaces must be repainted. To illustrate, if the life of one paint coat is 10 years, and of another only six to seven years, 50 per cent more material and labor will be required to keep the surfaces painted with the latter paint than with the former during a 20-year period.

Transporting Men in Emergency

In view of the restrictions on highway vehicles and the increasing lack of suitable train schedules, what methods can be employed to get repair men to water stations in cases of emergency? To transport men and materials in routine maintenance?

Speed Is Essential

By Guy E. Martin
Superintendent of Water Service, Illinois Central, Chicago

Time is an important element in the repair of water facilities. These repairs often involve the restoring of much-needed facilities for trains, and in many cases it means the making of repairs to equipment and returning it to service before the water supply is exhausted or inconvenience is experienced by trains. With convenient transportation, it is frequently possible to make such repairs without anyone but the plant operator and the repairman knowing of the condition that made the repairs necessary.

Many roads have recognized the importance of being able to get repairmen to water stations in time to prevent failures of the equipment. For this purpose they have provided small trucks and, in some cases, have authorized the use of privately-owned automobiles for this purpose. In most cases this form of transportation has proved to be of considerable benefit. Restrictions on the use of these vehicles will undoubtedly be accompanied by an increase in the number of water failures, as well as by an increase in the cost of maintenance. It is to be hoped that any restrictions that may be put on these vehicles will be held to the minimum.

Restricted use of such vehicles for emergency work may be met by using track motor cars and by riding trains to and from headquarters. The use of passenger trains is generally limited to scheduled stops, leaving many intermediate water stations that cannot be reached by riding these trains. With the large increase in business that we are now handling there is usually a freight train that can be used in cases of extreme emergency, although these trains are inconvenient and it is undesirable to stop them to pick up the men and let them off. The handling of tools and the heavy material which is frequently required for making the repairs, creates further delay to these trains, causing their use for this purpose to be still more objectionable.

However, on a busy railway, the use of freight trains for emergency work is more desirable than the use of a track motor car. The increase in the number of freight trains makes the time required to cover certain distances on motor cars uncertain and the transport of heavy material on those cars hazardous. The motor car

can be used to advantage on branch lines, where traffic is comparatively light. Each water station will have its own particular problem with respect to the time involved and the means to employ to reach it. On long districts it is likely that a rearrangement of some headquarters may be necessary, increasing the number of repairmen. Any change from the use of motor vehicles will undoubtedly result in an increase in the payroll.

The manner in which routine maintenance is carried out will doubtless have considerable bearing on the amount of emergency work that will be necessary. Well-maintained facilities have less failures than those not so well maintained, so that they stand in need of less emergency repairs. A well-defined plan for maintenance will eliminate some of the emergency work. Some maintenance can be done by the district repairman, but usually more will be needed than he can do. I believe that routine maintenance can best be done by small gangs of three to five men. If camp and tool cars are provided, each group can be moved from one place to another by train. If available, trailers can be used as living quarters, with trucks to carry tools and move the trailers from place to place. The handling of maintenance in this manner will save many trips to and from headquarters and thus provide more time for work.

No Immediate Substitute

By Water Service Inspector

When practices have become stabilized we always suffer some confusion if it becomes necessary to change them suddenly. The effects of the war have unsettled us in many ways, not the least of which have been the restrictions that have been imposed on highway transportation, which we are just beginning to feel, and which I hope will not grow more severe. We have no local passenger trains on our main lines or on most of our branches; there are few local freights and such as there are run only two or three times a week, and are of no help in an emergency. Because this situation has existed for more than 10 years, we have built up almost complete dependence on motor trucks and automobiles to handle both routine and emergency deliveries of materials and for the transportation of our repair forces.

To abandon this system now will be a serious matter, for we have no substitute transportation that can be used to advantage immediately. Obviously, we can employ motor cars, but there is a real hazard in carrying tools and heavy materials on them, especially at night when many of the emergency calls are made. Furthermore, unscheduled trains are running at short intervals, thus increasing the hazard. We can also employ freight trains in emergencies, but this is far from satisfactory for it always causes delay. Heavy materials must be loaded and unloaded and if the train does not stop at the right place, it may be extremely difficult to get this material to the point of use. Obviously, we will get along some way, for we will not throw up our hands, but at the moment we can think of no satisfactory substitute for highway transportation for repair jobs.

Maintaining Coaling Plants

In view of the record traffic now being handled, and considering its importance, what precautions should be taken to prevent failure of coaling plants that are not considered necessary under normal operations? Who should look after this?

Make Inspections Close

By W. A. Huckstep
General Building Supervisor, Missouri Pacific, St. Louis, Mo.

Inspections of coaling stations should be made monthly to determine the condition of the structures and the maintenance work required for safe and economical operation. At least twice each year overhead storage bins should be emptied to permit inspection of the interior walls and fixtures. The inspection should include:

(a) Track hoppers, track beams, breaker bars and bucket well, including drainage pit; (b) operating machinery, including adjustment of operating cables and timers for the skip hoist type; (c) superstructure, including inclines and trestle; (d) aprons and gates, including adjustment of counterweights, apron sheaves, cables and connectors, and where gates are provided, aprons should be lowered and raised to permit thorough inspection, and to insure that they are in working order, this observation being made when locomotives are taking coal; (e) sanding facilities, including operation of the spouts and valves.

(f) Maintenance of the station and equipment by the operator (proper adjustment and lubrication will prolong the life of the equipment and reduce maintenance changes). Cables subjected to locomotive gases, particularly where aprons are placed under the chute, require thorough dressing with cable lubricant, applied hot every 90 days. Approximtely 1 lb. of the dressing should be applied every 40 to 60 ft., after the cable has been cleaned thoroughly with a wire brush.

(g) Electric connections, control and motor; (h) safety appliances and fire-fighting facilities; (j) elimination or control of fire hazards.

(k) A check to see that recommended spare parts are on hand and that replacement material is made available promptly for any structural members or working parts which inspection discloses to be nearing the time for renewal, so that it will be on hand in case of an emergency. At stations employing electric motors, a spare motor should be available at some point from which it can be sent for emergency use.

Inspections of mechanical coaling stations should be made by: (a) The bridge and building supervisor, monthly; (b) the water service foreman (where he is delegated to maintain the station), monthly; (c) the electrical supervisor, or his representative, monthly for stations having electric controls; (d) the division engineer, semi-annually; (e) a representative of the maintenance-of-way department, semi-annually; (f) a representative of the mechanical department, where the coal chute is located at a terminal, quarterly. If the plant has an incline track and elevated pockets or consists simply of elevated pockets that are filled with a clamshell, it should be inspected by the bridge and building foreman monthly and by the supervisor bi-monthly.

Primary responsibility for the maintenance of coaling plants should rest with the supervisor of bridges and buildings, who may delegate certain fixed responsibilities to his bridge and building and water service foremen. At times, work on coaling stations necessitates the use of mechanical shop forces, bridge and building carpenters, water service repairmen and electricians, and here co-operation on the part of all of these men is essential to successful maintenance.

For coaling plants that employ electrical equipment, the supervisor should make definite arrangements, through fixed employees, for immedi-

ate contact with the electrical supervisor or the electrician responsible for the electrical work at coaling stations in case a breakdown occurs or other emergency arises necessitating the service of an electrician. It has been the experience of many supervisors that the greatest delays encountered in getting an electrically-operated coaling station back into service have occurred in finding and getting an electrician to the point of trouble.

Be More Careful

By Supervisor of Bridges and Buildings

The failure of a coaling plant is always somewhat in the nature of a disaster. Today it is no different, except in degree, from what it has always been. However, in view of both the density and the importance of the traffic we are now handling, we should give more careful attention to our coaling stations, to insure against failures, for even a minor failure may tie up traffic on a busy line in such a way that it will have far-reaching and costly effects. A major failure at this time may become a major disaster.

For these reasons, inspections should be frequent, maintenance should be carried out carefully, operators should be supervised more closely and the stock of repair parts to be kept on hand should be increased enough to insure that replacements for critical parts will be readily available. As parts become worn, replacement parts should be ordered earlier than is done normally to guard against the delays we are experiencing in obtaining deliveries. In other words, the essential requirements have not changed, but the conditions under which we are operating demand that we give more careful attention to the equipment than is considered necessary normally.

How About Economy?

To what extent should considerations of economy now be ignored in the reclamation and recovery of materials for reuse? What materials? Why?

Always Keep in Mind

By Division Engineer

Economy should never be lost sight of or ignored, but what may be economy today may have been the grossest extravagance yesterday and may be again tomorrow. For instance, 131-lb. rail would not have been economical for any road 50 to 60 years ago, because the axle loads of that period did not demand so large a section of rail. Again, we have been compelled to have a blacksmith and machinist make certain machine parts by hand during recent months, because the manufacturer from whom we have bought them heretofore has converted his factory into a war plant and cannot furnish them to us. The cost of hand manufacture is far above the normal price, but we cannot afford to shut down our equipment, so that it is economy to do what we have done. When the manufacturer goes back to civilian production, however, it will be ridiculous for us to continue to make the parts by hand.

It is much the same in the recovery and reclamation of materials for reuse. Any road that makes a thorough search will find four classes of materials—items that can be reused without alterations or repairs: obsolete materials in good condition; damaged, worn or broken materials that can be salvaged; and materials that cannot be reused. In the first case there may be no cost of recovery, except handling and transportation. On the other hand, this cost may be very high, in fact, so high that up to now it has been prohibitive.

In the second classification, it is possible in some cases to make obsolete material usable at almost negligible cost; in others, this cost may be out of proportion to the normal value of the item; yet if a machine can be kept in operation, a building or other structure be completed or repairs to a much-needed facility be made by undertaking the larger expenditure, it may result in large economy, even though by comparison with normal times it may seem highly uneconomical to do so. This is true particularly if the part or material is of such a character that it cannot now be obtained or its delivery is subject to long delay. Much the same comment can be made concerning materials falling in the third classification.

These are not normal times. The present generation scarcely understands what a real shortage of material is. True, we have been restricted in the use of materials, but there have been few of them that could not have been obtained readily at any time. In my experience it has been a shortage of funds and not of materials that has caused most of our trouble with respect to procurement. Today, the situation is reversed. Money is more plentiful than most of us have ever thought might be possible, but a wide range of materials are practically unobtainable. For this reason, the question of economy, as it applies to the salvage of materials, may be of negligible importance, if by making the expenditure necessary to accomplish the salvage we are able to bring about a longer and wider economy by keeping the whole transportation plant in good working order.

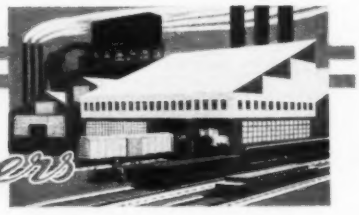
What Is Economy?

By General Inspector of Buildings

Before this question can be answered, we must know what economy is. Some of us have defined it as restriction of spending, but this may not be true economy since, if a structure fails by reason of inadequate maintenance because of restricted spending, the cost of replacement or the loss of revenue resulting from the failure may be many times what the cost of satisfactory maintenance should have been. Others consider low cost a demonstration of economy, and in some cases this is correct, but if quality is not obtained, low cost may be the reverse of economy. In general, the value obtained from an expenditure is the measure of the economy obtained. This may be expressed as the value of physical units; as an increase in the amount of work done; as the prevention of a loss; or as revenue. On this basis an identical expenditure may be economical under one set of conditions and uneconomical under other conditions.

On the foregoing basis, I do not see how we can ignore considerations of economy in the salvage of materials. However, our ideas of economy may need revision temporarily to enable us to adjust ourselves to the situation that has been created by our all out war effort. We are all inclined to look upon low cost as the principal foundation stone of economy, and in many cases it is, but not necessarily so. On the other hand, high cost or large expenditure may result in greater economies than restricted spending. We should consider carefully what will be the result if we do not salvage the material,: what will be gained by doing so and what the cost will be. Where essential material cannot be obtained there will be cases where almost any expenditure within reason will be justified if the salvaged material can be used.

PRODUCTS of Manufacturers



Instant-Use Resurfacer

THE Flexrock Company, Philadelphia, Pa., has developed a new floor-surfacing material, known as Instant-Use Resurfacer, which is said to be ready for traffic immediately after installation. Designed for use with all types of floors, the material can be used either for patches or for covering the entire floor surface. To apply the material, the floor or area to be patched is simply swept clean and primed, after which the resurfacer, which comes ready-mixed, is shoveled on and tamped in position. It is claimed that the material is durable and resilient, that it will adhere to oily or greasy floors, that it will not chip or crack, and that it is particularly adaptable to machine shop floors where workers must stand in one position for long periods.

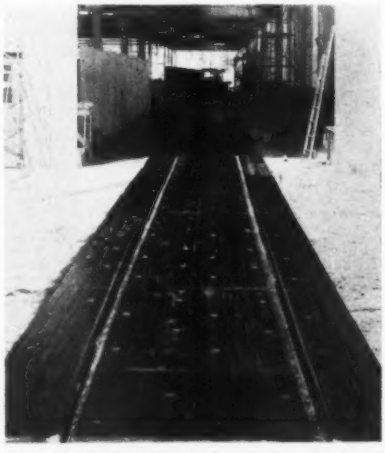
Patching a Floor With Instant-Use Resurfacer

Creosoted Black Gum Sectional Flooring

THE T. J. Moss Tie Company, St. Louis, Mo., has developed an interesting adaptation of its creosoted black gum crossing sections in the form of sectional flooring for tracks in locomotive and car shops, enginehouses, warehouses and other similar buildings to provide tough hard-wearing surfaces for safe jacking and the trucking of heavy parts about and across railway tracks.

The Moss creosoted black gum sectional flooring is completely prefabricated and is shipped to the job ready for quick installation. The sections are designed of preframed timbers, for specific rail heights, the timbers being dressed to the required thickness and width and cut to the proper length. After treatment, the timbers are bolted together to form the sections, which are laid directly on the track ties and fastened to them with countersunk lag screws, sealed with mastic. Laterally across a track, the flooring consists of four units, two side by side between the rails, and the other two outside the rails on opposite sides of the track.

All sections are framed on the underside to accommodate the tie plates, rail base and track spikes. The top edges adjacent to the outside of the rails are chamfered to prevent abrasion by car and locomotive wheels and to provide adequate allowance for rail wear and for the settling of the tie plates into the track ties. Flangeway strips of specially shaped creosoted black gum, which fit snugly over the tie plates, rail base and fastenings, are installed between the sections and the gage side of the rails. This facilitates easy cleaning of the crossing and prevents water and dirt from being carried down to the track.



Moss Creosoted Black Gum Sectional Flooring Which Was Extended Outside the Building to Also Form a Highway Crossing

In addition to the ability of Moss creosoted black gum sections to stand up under heavy traffic, a number of other advantages are claimed for this construction. They are easily and economically installed with unskilled labor, using ordinary tools and the sectional feature facilitates subsequent track maintenance because the sections can be removed and replaced easily and without damage or loss or, if a building is abandoned, the flooring can be salvaged and used elsewhere. An additional advantage of the Moss sectional floors at the present time is that they do not require any metal except lag screws and bolts.

What Our Readers Think

Maintenance Men Top Bond Drive

Greenville, Pa.

TO THE EDITOR:

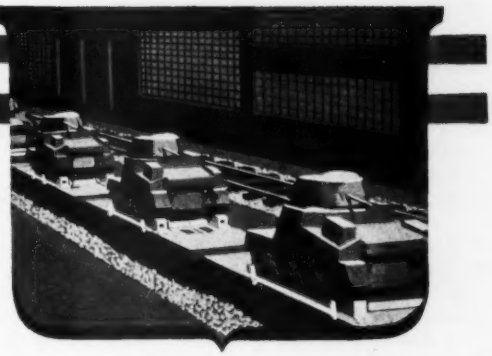
I was very much interested in your letter to readers in the November issue of *Railway Engineering and Maintenance* on the subject of Minute Man Flags. I know that you will be interested to learn that 99.37 per cent of the employees in the maintenance of way department of the Bessemer & Lake Erie have subscribed to War Savings Bonds through our payroll deduction plan, this representing the highest percentage subscribing in any of the departments of our railroad.

Each group on the road that attained a percentage of 90 per cent or more in subscriptions was awarded a Minute Man Flag. In the maintenance of way department, the flag awarded was mounted on a pedestal and staff, and was sent to Conneaut, Ohio, to be displayed with each gang at that point for a period of two days, following which it was moved to the next gang south. This program will be followed until each gang has had the flag in its possession for two days, and carries out the thought you express in the second paragraph of your letter. It is really amazing how our men responded to the bond solicitation.

I was also very much interested in the editorial on page 789 of the November issue entitled, Foremen—Guardians of Our War Traffic. Our experience here confirms just what you say in this editorial with regard to the faithful performance of duty of foremen, and we are taking every opportunity to commend our men on the fine showing that they are making during this trying period.

F. R. LAYNG,
Chief Engineer, Bessemer & Lake Erie

NEWS of the Month



Survey for Railroad to Alaska Completed—Filed

On December 10 the War Department revealed that a survey for a trans-Canadian railroad to Alaska to supplement the Alcan highway had been completed by the Army Engineers in co-operation with the Canadian government, but that the plans "have been filed for possible future wartime use," since it does not consider that a military necessity exists for the construction at the present time.

Mediation on Wage Demands to Start January 7

Mediation conferences on the demand of 15 non-operating unions for a wage increase of 20 cents an hour and a closed shop will begin at Chicago on January 7. While the War Labor Board has jurisdiction over all labor controversies at the present time, present indications are that the regular Railway Labor Act procedures will prevail. Whether any settlement will have to be approved by the War Labor Board before it can be made effective, is a matter that has not been determined, although it is understood that tentative executive orders have been drafted to clarify the situation.

16 Per Cent of British Railway Employees Are Women

The British main line railways and the municipally-owned London passenger transportation system at present employ more than 105,000 women, equivalent to about 16 per cent of the total railway personnel, in a great variety of jobs, according to the British Supply Council in North America. In 1939 the total was 27,000, or about 4 per cent.

In peacetime, the British railways employ women mainly for such jobs as waitresses in station restaurants, for cleaning and clerical work and certain jobs in shops. Today women are employed in practically every department—in both skilled and unskilled jobs in shops, as ticket clerks in stations, ticket collectors, in signal towers, on track work, in repairing, lubricating and watering engines, and for road transport in connection with the railways. However, they have not as yet been permitted to act as enginemen or trainmen.

Maximum Prices for Ties

A new maximum price regulation No. 284 and a complete revision of regulation No. 216, have been announced by the Office of Price Administration, increasing maximum prices for ties in the Western and Eastern halves of the United States, respectively. The new regulations, which were effective December 18 and 21, were issued after a study showed that tie production had fallen off about 23 per cent in 1942, as compared to the previous year, in the face of increased demands.

New regulation No. 284 provides substantial increases in the Western states, while revised regulation No. 216 for the Eastern states provides an increase of about 10 per cent over March, 1942, tie prices and sets up specific dollars and cents ceiling prices, varying with different production districts, which are stated to reflect railroad experience as to price levels that will encourage continued output.

Asks for 415 More Miles of Line

On December 5 the Office of Defense Transportation reported that the War Production Board had asked if certain lines, totaling 415 miles, were essential to war transportation. Under the procedure now in effect, an examiner investigates the conditions under which each line is operated and makes his recommendations to ODT Director Joseph B. Eastman. After the recommendation is made public, interested parties have two weeks within which to file protests or comments before final action is taken.

Continued active interest on the part of some members of Congress in the activities of the WPB and other government agencies in requisitioning rail lines was indicated by the appearance of representatives of the War Department and the WPB before a Senate Interstate Commerce subcommittee. On December 3 Senator Millikin, of Colorado appeared before this committee to protest against what he termed arbitrary and senseless policies, resulting in administrative acts contrary to the wishes of Congress. He appealed for the adoption of procedure in cases of proposed rail requisitions which would require investigators to visit the sections served by the lines under study before recommendations are made as to their essential character for war transportation.

In the course of questioning on the same day, Major E. T. Butler stated that he was authorized to say for the War Department that Army requirements for rail for the year 1943 would not go beyond those already submitted to the WPB Transportation Equipment division and given to the committee, amounting to somewhat more than 7,000,000 ft. He also indicated that these requirements could be met to a large extent by use of relay rail now reported to be available to the WPB.

At another session of the committee, ODT Director Joseph B. Eastman stated that the ODT would discontinue its present procedure of certifying to the WPB whether lines are essential to war transportation, and recommend that normal I.C.C. abandonment procedures be followed, as soon as it was demonstrated that military necessity no longer requires this emergency treatment.

Further questioning by committee members brought statements from WPB representatives that the WPB has no immediate plans for actual requisition of all the lines which the ODT certifies as not essential to war transportation, but is having such recommendations made in advance of its actual requirements so that it will be in position to act promptly to requisition such lines if and when a need does develop.

Pullman Carried Eight Million Troops in 1942

More than 8,000,000 soldiers, sailors and marines were transported a total of 9 billion passenger-miles by the Pullman Company in 1942 while at the same time more than 18,000,000 civilian passengers, the largest number since 1931, were carried 10 billion passenger miles.

The pool of cars operated by the Pullman Company received its first test in the first three weeks of the war when 208,110 troops were handled in sleeping cars. In January, more than twice that number were carried, and the volume of organized troop movements by Pullman has increased to a point where it has amounted to more than 800,000 during each of the last three months.

Keyed completely to the war effort in the most intensive operations possible, the Pullman Company has employed every available unit in its fleet, with many of its cars serving as sleeping cars on night trips and doubling back in the daytime in coach or parlor car service. Many units of types not needed under wartime conditions, such as lounge, parlor and observation cars, have been or are in the process of extensive remodeling for conversion into high-capacity, triple-berth sleeping cars, especially useful in the troop transport fleet. Hundreds of cars that have been retired from regular train service during the period of reduced travel volume prior to the war were very fortunately retained in storage, and, now reconditioned, are performing valuable service in the troop transport fleet.

Personal Mention

General

R. L. Sahm, supervisor of track on the Buffalo division of the New York Central, with headquarters at Batavia, N.Y., has been promoted to trainmaster, with headquarters at Kingston, N.Y.

W. W. Salisbury, roadmaster of the Missouri Pacific at St. Louis, Mo., has been promoted to master of trains and track of the Missouri-Illinois (part of the Missouri Pacific system), west of the Mississippi river, with headquarters at Bonne Terre, Mo., succeeding **G. M. Helmig,** who has been granted a leave of absence for special service for the U. S. Government with the American Railroad Mission in Mexico.

John A. Rogers, superintendent on the Canadian National, with headquarters at Ottawa, Ont., and an engineer by training and experience, has been promoted to assistant general superintendent of the Alberta district, a newly created position, with headquarters at Edmonton, Alta. Mr. Rogers was born at Cayuga, Ont., on July 19, 1883, and attended the Royal Military College, Kingston, Ont. He entered railway service in 1904 as a draftsman on the Illinois Central at Chicago, and went with the National Transcontinental Railways (now part of the C. N. R.) as an engineering assistant in 1905. He later served as a resident engineer of the Mackenzie Mann Company at Edmonton, Alta., and as division engineer on the Canadian Northern (now the C. N. R.) at Saskatoon, Sask. During World War I he engaged in military service, then returning to his former position at Saskatoon. In 1927 he was promoted to assistant superintendent, with the same headquarters, and in 1930 he was advanced to superintendent at Prince Albert, Sask. Mr. Rogers was transferred to Hornepayne, Ont., in 1930, to Allandale, Ont., in 1934, and to Ottawa in 1938.

Howard W. McCauley, whose promotion to superintendent of the Yellowstone division of the Northern Pacific, with headquarters at Glendive, Mont., was reported in the December issue, was born at St. Paul, Minn., on June 29, 1897, and attended the College of St. Thomas at St. Paul, Minn., and the University of Minnesota. During summer vacations he worked in the office of the car accountant of the Northern Pacific and in February, 1918, became regularly employed in the engineering department of the Chicago, St. Paul, Minneapolis & Omaha at St. Paul. Later that year he worked in the engineering department of the Great Northern at Superior, Wis., and in 1920 transferred to the valuation accounting department at St. Paul. In 1923, he returned to the engineering department of the Northern Pacific and on April 1, 1924, was promoted to bridge inspector at Glendive. After serving as roadmaster at Carrington, N.D., Staples, Minn., Tacoma, Wash., Mandan, N.D., and Helena, Mont., and division roadmaster at Minneapolis, Minn., he was made trainmaster-roadmaster of the Minnesota & International (a subsidiary of the Northern Pacific) at Bemidji, Minn., on December 1, 1937. On November 1, 1939, he was made trainmaster at Jamestown, N.D., and on April 1, 1942, he was promoted to superintendent of ore operations at Superior, which position he held until his recent promotion.

Joseph E. A. Gibault, assistant general manager of the Atlantic region of the Canadian National, with headquarters at Moncton, N.B., was appointed assistant chief of research and development, with headquarters at Montreal, Que., succeeding **W. M. Armstrong,** whose appointment as general manager, Canadian National Telegraphs, was reported in the December issue. Mr. Gibault, who was born at St. Jerome, Que., began his technical training at Mount St. Louis Institute, Montreal, and was graduated from the Polytechnical school, University of Montreal, with degrees in civil and mining engineering, in 1910. During his student days, Mr. Gibault had practical experience as a concrete inspector on the Montreal aqueduct and also as chainman and rodman of the National Transcontinental (now Canadian National). After graduation he was employed for a time as a draftsman and designer at Pittsburgh, Pa., subsequently returning to Canada as an employee of the National Transcontinental. In June, 1915, he transferred to the Canadian National as resident engineer, at Cochrane, Ont. He then served as division engineer successively at Quebec, Que., and at Levis. In April, 1924, Mr. Gibault was appointed to the Bureau of Economics in a technical capacity as assistant engineer. In September, 1927, he returned to the Canadian

Joseph E. A. Gibault

National as superintendent of the Levis division, being transferred to Montreal in July, 1931, and to Campbellton, N.B., in September, 1932. In August, 1940, Mr. Gibault was appointed assistant general manager, Atlantic region, at Moncton.

George D. Brooke, president of the Chesapeake & Ohio, the Nickel Plate and the Pere Marquette, and an engineer by training and experience, has retired at his own request. Mr. Brooke was born at Sutherlin, Va., on September 15, 1878, and graduated from Virginia Military Institute in 1900, following which he was an instructor at Culver Military Academy for two years. In 1902 he entered railway service as a rodman on the Baltimore & Ohio, later being advanced successively to levelman, transitman, field engineer and assistant engineer. In 1908 he became assistant division engineer at Pittsburgh, Pa., and, the following year was promoted to division engineer at Baltimore, Md. In 1911 he was transferred to the operating department as an assistant engineer. Shortly thereafter, Mr. Brooke was appointed assistant superintendent at Cumberland, Md., and, in 1912, became superintendent at Winchester, Va. He served subsequently as superintendent on several other divisions, becoming a special representative in the transportation department in 1918. A few months later he

George D. Brooke

entered the service of the United States Railroad Administration as supervisor in the operating department of the Allegheny region. After the war he returned to the Baltimore & Ohio as superintendent of transportation at Cincinnati, Ohio.

In 1924, Mr. Brooke went with the Chesapeake & Ohio as assistant to the president at Richmond, Va., and two years later, he was appointed general manager. In 1930 he was advanced to vice-president and general manager, and in 1933 his responsibilities were further enlarged, under the title of vice-president—operation and engineering, of both the Chesapeake & Ohio and the Nickel Plate. In 1937 he became executive vice-president, and the Pere Marquette was also included among the properties under his supervision. Mr. Brooke was elected president of the Chesapeake & Ohio on December 29, 1937, and a few weeks later he succeeded also to the presidency of the Nickel Plate and the Pere Marquette. He has been active for many years in the affairs of the American Railway Engineering Association, as a committee chairman and, in 1930-31, as its president.

Engineering

Raymond C. Lowrey, engineer maintenance of way and structures of the Missouri & Arkansas, has been appointed chief engineer, with headquarters as before at Harrison, Ark., a change of title.

John C. Bock, bridge inspector of the Chicago, St. Paul, Minneapolis & Omaha, at St. Paul, Minn., has been promoted to

acting assistant chief engineer, with the same headquarters, succeeding **Charles E. Hise,** who has been granted a leave of absence for military service.

Thomas L. Landers, regional engineer, maintenance of way, of the Atlantic region of the Canadian National has been appointed chief engineer of the Atlantic region, with headquarters as before at Moncton, N.B., succeeding **Frederick O. Condon,** who has retired after 49 years of service.

W. H. Bettis, assistant engineer on the Norfolk & Western at Roanoke, Va., has been transferred to Portsmouth, Ohio, succeeding **C. E. Armstrong,** who retired on January 1. **H. F. Smith,** crossing engineer, with headquarters at Roanoke, has been promoted to assistant engineer, with the same headquarters, relieving Mr. Bettis, and **H. C. Charlton** has been appointed crossing engineer, replacing Mr. Smith.

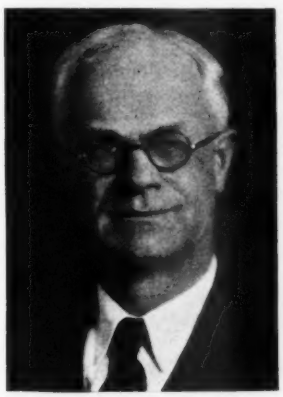
A. V. Johnston has been appointed division engineer of the Hornepayne division of the Canadian National, with headquarters at Hornepayne, Ont., succeeding **F. C. Mattocks,** transferred to the Allandale division, with headquarters at Allandale, Ont. Mr. Mattocks succeeds **D. E. Carriere,** who, in turn, has been transferred to the St. Thomas division, with headquarters at St. Thomas, Ont., succeeding **S. B. Wass,** transferred to Toronto, Ont., with jurisdiction over the Toronto terminals. Mr. Wass succeeds **L. I. Stone,** who has been promoted to assistant district engineer, Northern Ontario district, with headquarters at North Bay, Ont.

Herbert R. Clarke, chief engineer maintenance of way of the Chicago, Burlington & Quincy, the Colorado & Southern, the Ft. Worth & Denver City and the Wichita Valley (Burlington Lines), has been promoted to chief engineer of the Burlington Lines, with headquarters as before at Chicago, succeeding **Frank T. Darrow,** who retired on January 1. Mr. Clarke was born in Ireland on November 15, 1882. He came to America with his parents in 1888 and graduated from Monmouth College, Monmouth, Ill., in 1906. He entered railroad service in 1906 as a chainman on the Missouri Pacific, later being promoted to rodman. In 1907 he went with the Chicago, Burlington & Quincy as a rodman, later being advanced to instrumentman and extra gang foreman. In July, 1909, he was appointed resident engineer on the construction of a line from Herrin, Ill., to Paducah, Ky., and in May, 1911, he was promoted to roadmaster on the Aurora division. Mr. Clarke was advanced to general roadmaster of the McCook division in November, 1919, and in October, 1921, he was promoted to district engineer of maintenance for the Lines West of the Missouri River, with headquarters at Lincoln, Neb. In January, 1925, he was advanced to general inspector of permanent way and structures for the system, with headquarters at Chicago, and in 1927 his jurisdiction was extended to include the Colorado & Southern. In 1931 Mr. Clarke was promoted to engineer maintenance of way of the Burlington Lines (which include also the Ft. Worth & Denver City and the Wichita Valley), and in January, 1942, he was advanced to chief engineer maintenance of way. Mr. Clarke has been active for many years in the American

Herbert R. Clarke

Railway Engineering Association and is at present president of that association. He is also a past-president of the Roadmasters' and Maintenance of Way Association of America.

Mr. Darrow was born at Corning, Iowa, on September 2, 1875, and graduated in civil engineering from Allegheny college, Meadeville, Pa., in 1897. Before his graduation, he was connected for several years with the Standard Box Factory, Portland, Ore., and also served with the Erie for three years at Corry, Pa. In 1897, he entered the service of the Burlington & Missouri River (now the C. B. & Q.), where he was engaged on location, construction, maintenance and bridge work until 1905, when he was appointed engineer maintenance of way of the Nebraska district. In 1907, Mr. Darrow was advanced to principal assistant engineer of the Lines West of the Missouri



Frank T. Darrow

river, with headquarters at Lincoln, Neb. In 1909, after serving for a short time as assistant engineer maintenance of way at Lincoln, Mr. Darrow was advanced to engineer maintenance of way with the same headquarters. In 1918, he was appointed assistant chief engineer of the Lines West of the Missouri river, which position he held until January, 1937, when he was promoted to chief engineer at Chicago.

John Robert Caswell, assistant district engineer of the Canadian Pacific at Toronto, Ont., has been promoted to district engineer, with headquarters at North Bay, Ont., succeeding **Samuel Bruce McConnell,** who retired after more than 44 years of service with the Canadian Pacific. Mr. Caswell was born on May 13, 1891, and entered railroad service with the Canadian Pacific in April, 1910, as a chainman in the engineering department at Toronto, Ont. Later that year he transferred to the construction department of the Georgian Bay & Seaboard (Canadian Pacific), and subsequently served as watchman, rodman and instrumentman, becoming transitman in the engineering department at London, Ont., in April, 1914. He was appointed reserve engineer at London, in 1918, and in April, 1920, became division engineer, with headquarters at Sudbury, Ont., transferring to Smith's Falls, Ont., in July, 1924. He was appointed acting assistant district engineer, operating department, at Toronto, in

John Robert Caswell

August, 1939, and assistant district engineer in April, 1940, in which position he was serving at the time of his recent appointment.

Mr. McConnell was born on May 22, 1880, and entered railway service with the Canadian Pacific in the summer of 1898 as a chainman, land survey department, with headquarters at Vaudreuil, Que., and Pointe Fortune. In the spring of 1899, he became transitman of the Lachine Canal branch, and in 1902 was appointed assistant engineer, engineering department, of the Lake Superior division. In September, 1905, he went to Montreal, Que., and in 1910 became assistant division engineer, engineering department, at Montreal. He was appointed division engineer at Lake Superior and North Bay in July, 1913, and in 1917 was transferred to the Algoma district. In 1919, Mr. McConnell was appointed district engineer of the Algoma district and remained in that position until his recent retirement.

Blair Blowers, division engineer of the New York division of the Erie, with headquarters at Jersey City, N.J., has been appointed acting engineer maintenance of way of the Western district at Youngs-

town, Ohio, to succeed **H. M. Righter,** who has been granted a leave of absence because of ill health. **R. H. Jordan,** assistant division engineer of the Mahoning division, with headquarters at Youngstown, has been promoted to division engineer of the Kent division, with hadquarters at Marion, Ohio, to succeed **P. F. Nichols,** who has been transferred to the Mahoning division at Youngstown, to succeed **R. L. Dyke,** who has been transferred to the Delaware, Susquehanna and Tioga divisions, with headquarters at Hornell, N.Y. Mr. Dyke succeeds **H. J. Weccheider,** who has been transferred to the New York division at Jersey City to replace Mr. Blowers.

William E. Ross, whose promotion to division engineer on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Ottumwa, Iowa, was reported in the December issue, was born at Otterville, Mo., on January 15, 1910, and attended

William E. Ross

the Central Missouri State Teachers College from 1927 to 1929 and the University of Missouri from 1932 to 1935. From September 6, 1929, to September 6, 1932, Mr. Ross served as a rodman for the Missouri State Highway Department at Jefferson City, Mo., and on August 1, 1935, he returned to the Missouri State Highway Department as a levelman. On March 20, 1936, he entered railway service as a rodman on the Milwaukee, later being promoted successively to instrumentman and assistant engineer. On May 15, 1942, he was granted a leave of absence to serve as chief civil engineer for Harley & Ellington, architect-engineer on the construction of the Terre Haute (Ind.) Ordnance Depot. Mr. Ross was engaged on this work at the time of his recent promotion, effective November 1, and assumed his new duties on November 21.

Five new second assistant division engineers have been appointed on the Southern Pacific as follows: **Harry M. Williamson,** office engineer on the Western division, to second assistant division engineer of the Portland division; **Edwin O. Williams,** assistant engineer on the Rio Grande division, to second assistant division engineer on that division; **George E. Stewart,** roadmaster on the Western division, to second assistant division engineer on the Sacramento division; **Rex R. Baymiller,** assistant engineer on the Coast division, to second assistant division engineer on that division; and **George Morgan Rowe,** acting assistant division engineer on the Los Angeles division, to second assistant division engineer on the same division. **B. J. Hogan,** assistant engineer on the Interurban Electric Railway, has been appointed assistant engineer assigned to special duties, in the office of the chief engineer of the Southern Pacific at San Francisco, Cal. **E. T. Langdale** has been appointed assistant division engineer of the Los Angeles division, succeeding **J. P. Edwards,** transferred.

Track

George L. Glover, supervisor of track on the New York Central (Michigan Central) at Windsor, Ont., has been transferred to Niles, Mich., succeeding **Peter Margraf,** who retired on December 31.

J. D. Shipman has been appointed acting roadmaster on the Missouri-Kansas-Texas at Parsons, Kan., succeeding **Fred Hunter,** who has been assigned temporarily to other duties.

J. H. Logan, roadmaster on the Chicago, Rock Island & Pacific at Atlantic, Iowa, has been transferred to Peoria, Ill., succeeding **G. F. Carpenter,** who, in turn, has been transferred to Atlantic.

C. L. Goss, a section foreman on the New York Central, has been promoted to assistant supervisor of track at Cleveland, Ohio, succeeding **C. C. Wehrle,** whose promotion to supervisor of track on the Big Four at Galion, Ohio, was reported in the December issue.

Spirlen Shelton, section foreman on the Missouri & Arkansas at Wheatley, Ark., has been promoted to roadmaster, with headquarters at Leslie, Ark., a newly created position, with territory from Pindall, Ark., to Heber Springs.

R. C. Smith, assistant roadmaster on the Chicago & North Western at Mason City, Iowa, has been promoted to roadmaster at Redfield, S.D., succeeding **A. J. Johnson,** who has been transferred to Huron, S.D. Mr. Johnson relieves **E. M. McDermott,** who retired on January 1 after 47 years of service.

Charles C. Wehrle, whose promotion to supervisor of track on the New York Central (Big Four) at Galion, Ohio, was reported in the December issue, was born at Toledo, Ohio, on August 4, 1894, and studied business courses and a correspondence school course in engineering. He entered railway service on October 1, 1910, in the engineering department of the Lake Shore & Michigan Southern (now part of the New York Central system) and twelve years later he was promoted to assistant supervisor of track at Toledo. He was later transferred successively to Hillsdale, Mich., and Cleveland, Ohio.

Frank L. Vault, Jr., assistant supervisor of track of Subdivision 4 of the Eastern division, with headquarters at Hudson, N. Y., has been promoted to supervisor of track of Subdivision 31 of the St. Lawrence division, with headquarters at Remsen, N. Y., to succeed **Donald E. Fuller,** who has been transferred to Subdivision 12 of the Buffalo division, with headquarters at Batavia, N.Y. Mr. Fuller replaces **R. L. Sahm,** whose appoitment as trainmaster is noted elsewhere in these columns. **John Kowal,** an extra gang foreman, has been promoted to assistant supervisor of track at Hudson, to succeed Mr. Vault.

H. J. Pennington, roadmaster on the Southern Pacific at Ventura, Cal., has been promoted to general track supervisor, a newly created position, with headquarters at San Francisco, Cal., and **R. D. Sorrels,** roadmaster at Los Angeles, Cal., has been transferred to Ventura, relieving Mr. Pennington. **O. L. Parker** has been appointed roadmaster at Merced, Cal., succeeding **George E. Stewart,** whose appointment as second assistant division engineer of the Sacramento division, is reported elsewhere in these columns. **T. J. Reilly** has been appointed roadmaster at Los Angeles, replacing **H. W. Neuebaumer,** transferred. **E. R. Leonard** has been appointed roadmaster at Gila, Ariz., a newly created position.

L. B. Craig, supervisor of bridges and buildings on the Southern at Lexington, Ky., has been promoted to assistant roadmaster at Louisville, Ky., succeeding **G. A. McRoberts,** whose appointment as supervisor of bridges and buildings at Lexington, Ky., is reported elsewhere in these columns. **J. T. Roberts,** assistant supervisor of bridges and buildings at Louisville, has been promoted to assistant to the roadmaster at Somerset, Ky., replacing **M. P. Oviatt,** whose promotion to assistant supervisor of bridges and buildings at Birmingham, Ala., is also reported elsewhere in these columns. **T. W. Kinsley,** supervisor of bridges, buildings and track at New Orleans, La., has been appointed supervisor of track at that point, and the position of supervisor of bridges, buildings and track at New Orleans has been abolished.

Raymond Harry Becker, whose promotion to roadmaster on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Aberdeen, S. D., was reported in the December issue, was born at Chattanooga, Tenn., on January 26, 1899, and entered railway service on March 23, 1915, as a section laborer on the Iowa division of the Milwaukee. In October, 1916, he was promoted to relief section foreman and from April, 1933, to September, 1936, he also served as assistant extra gang foreman, machine operator and extra gang foreman on the Iowa, Des Mones, I. & D. and the H. & D. divisions. In March, 1937, Mr. Becker was promoted to section foreman on the Iowa division, and on May 12, 1941, he was advanced to general extra gang foreman, serving on the Iowa and I. & D. divisions until his recent promotion.

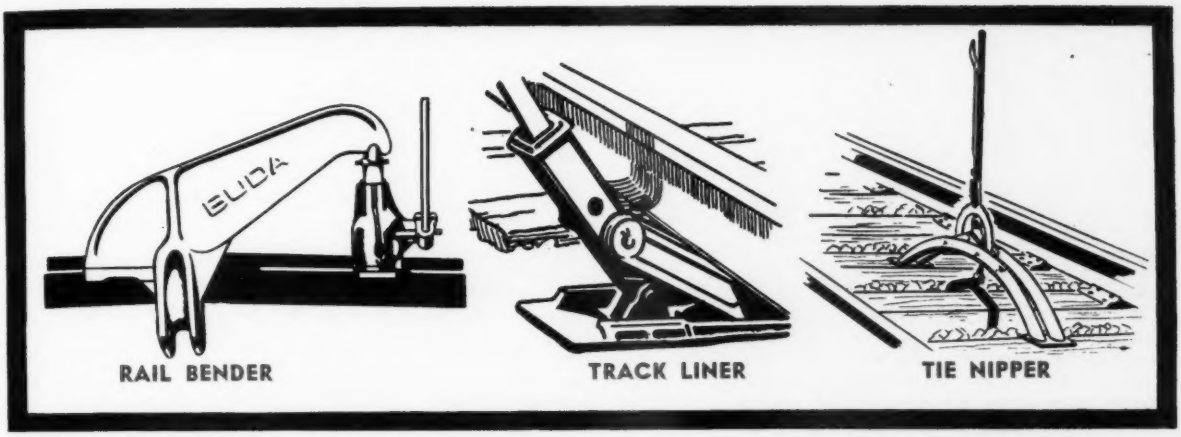
Bridge and Building

Matt Kleigle has been appointed master carpenter on the Chicago, Rock Island & Pacific at Rock Island, Ill., succeeding **J. L. Burne,** who has been assigned to other duties.

E. L. Parrish, general foreman of bridges and buildings on the Illinois Central at Vicksburg, Miss., has been promoted to supervisor of bridges and buildings, with the same headquarters.

(Continued on page 62)

Speed *Wartime* Maintenance



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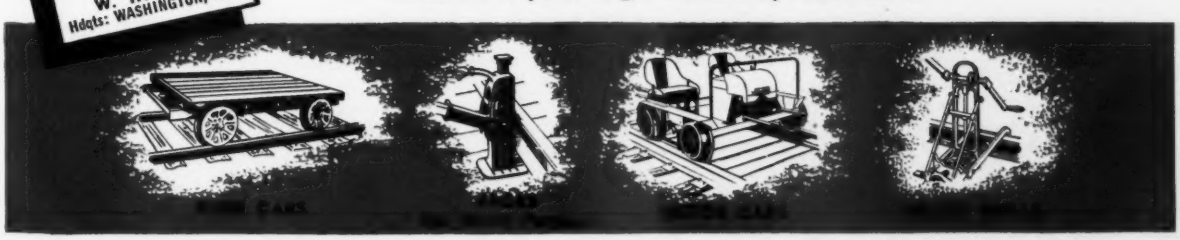

George Byron Davis, whose promotion to supervisor of bridges and buildings on the New York Central, with headquarters at Columbus, Ohio, was reported in the December issue, was born at Salem Center, Ohio, on November 19, 1887, and entered railway service on September 2, 1908, as a bridge carpenter on the Kanawha & Michigan (now part of the New York Central system) at Dexter, Ohio. On June 19, 1921, he was promoted to bridge foreman, which position he held at the time of his recent promotion, effective November 1.

J. R. Kelly, assistant supervisor of bridges and buildings on the Southern at Birmingham, Ala., has been promoted to supervisor of bridges and buildings at Hattiesburg, Miss., and **M. P. Oviatt,** assistant to the roadmaster at Somerset, Ky., has been advanced to assistant supervisor of bridges and buildings at Birmingham, succeeding Mr. Kelly. **W. G. Park,** assistant supervisor of bridges and buildings at Hattiesburg, has been transferred to Louisville, Ky., succeeding **J. T. Roberts,** whose promotion to assistant to the roadmaster at Somerset, Ky., is reported elsewhere in these columns, and the position of assistant supervisor of bridges and buildings at Hattiesburg has been abolished. **G. A. McRoberts,** assistant roadmaster at Louisville, has been appointed supervisor of bridges and buildings at Lexington, Ky., replacing **L. B. Craig,** whose promotion to assistant roadmaster at Louisville, is reported elsewhere in these columns.

Donald P. Kinzel, assistant supervisor of bridges and buildings on the River division of the New York Central, with headquarters at Weehawken, N. J., has been promoted to supervisor of bridges and buildings of the Mohawk division, with headquarters at Albany, N. Y., to succeed **K. L. Miner,** who has entered military service. **Joseph L. Hughes,** bridge and building inspector at Weehawken, has been promoted to assistant supervisor of bridges and buildings, with the same headquarters, to succeed Mr. Kinzel, and **Fred B. Heck,** bridge and building iron worker foreman on the Pennsylvania division, has been promoted to bridge and building inspector at Weehawken to replace Mr. Hughes.

Mr. Kinzel was born on December 10, 1898, at Rochester, N. Y., and attended Rensselaer Polytechnic Institute. He entered the service of the New York Central on July 1, 1921, as a chainman on the River division, becoming a rodman on October 23, 1922, and being appointed bridge and building inspector on May 16, 1923. He was further advanced to assistant supervisor of bridges and buildings at Weehawken on February 1, 1936, holding this position until his recent appointment as supervisor of bridges and buildings, effective December 16.

Special

Leo L. White, whose promotion to supervisor of maintenance of way equipment, Southern lines, of the Illinois Central, with headquarters at Memphis, Tenn., was reported in the December issue, was born at Wesson, Miss., in 1899, and entered railway service on July 11, 1918, as an apprentice in the motor car department of the Illinois Central at McComb, Miss. In 1919 he was promoted to mechanic and in December, 1925, he was advanced to foreman in charge of maintenance of way equipment at Gulfport, Miss. On November 17, 1937, Mr. White was appointed foreman in charge of maintenance of way equipment at Memphis, which position he held until his recent promotion.

Obituary

John A. Trainor, who retired as roadmaster on the Chicago, Rock Island & Pacific at Enid, Okla., in 1939, died in Dallas, Tex., on October 28, at the age of 68.

E. P. Fitzgerald, roadmaster on the Gulf Coast Lines (Missouri Pacific) at Bay City, Tex., died on October 30 in the memorial hospital, Houston, Tex., after nine months of illness at the age of 56.

A. B. Clark, who retired on April 30, 1938, as assistant to the chief engineer of the Pennsylvania, with headquarters at Philadelphia, Pa., died on December 21, at Trenton, N. J., ten days after suffering a heart attack. Mr. Clark was born at Green Village, Pa., in 1867, and attended Lafayette University, graduating in 1891. During his summer vacations of 1889 and 1890 he worked for the Pennsylvania, and after graduation from college, he returned to this company as a rodman on the Philadelphia division. Subsequently, Mr. Clark served in various capacities in the engineering department on different divisions until 1909, when he was promoted to division engineer of the Maryland division. In the following year, he became principal assistant engineer of the Philadelphia, Baltimore & Washington (part of the Pennsylvania), being appointed assistant engineer maintenance of way in 1913. Three years later he was transferred to the operating department as superintendent of the Renovo division, later being transferred to the Philadelphia Terminal division and thence to the Trenton divsion. He served as assistant to the chief engineer, with headquarters at Philadelphia, from April 16, 1930, until his retirement.

A. B. Warner, an engineer by training and experience, and at one time general manager of the Second district of the Chicago, Rock Island & Pacific, who retired in 1936 as superintendent of the Southern division of the Rock Island, with headquarters at Fort Worth, Tex., died at his home in El Reno, Okla., on November 20. Mr. Warner entered railway service in the engineering department of the Rock Island at Cedar Rapids, Iowa, in 1899, and was later transferred to Colorado Springs, Colo. In 1905 he was transferred to work on the construction of the Louisiana division, and then for four years was engineer in charge of the construction of the Cimarron bridge at Denver, Colo., and of the El Reno terminals. In 1913 he was promoted to superintendent of the Southern division at Fort Worth, and was later advanced to vice-president and general superintendent of the Chicago, Rock Island & Gulf (Texas lines of the Rock Island). In 1923 he was appointed general manager of the Second district of the Rock Island, with headquarters at El Reno, and in 1932 was granted a leave of absence because of ill health. He returned to service in 1933 as superintendent of the Southern division at Fort Worth, which position he held until his retirement.

Association News

Metropolitan Maintenance of Way Club

Eighty-five members and guests attended the meeting of the club at noon on December 10 at the Hotel Governor Clinton, New York. Following luncheon, the meeting was addressed by J. B. Jones, superintendent, New York division, Pennsylvania, who spoke on the subject, "Toward Operating Efficiency Through Departmental Teamwork."

Roadmasters' Association

Members of the Executive Committee met in Chicago on December 5, with President E. L. Banion, Vice-President H. E. Kirby, Secretary L. Kindred, Executive Committee members S. J. Hale and A. B. Hillman, and Past Presidents C. W. Baldridge, H. R. Clarke and Elmer T. Howson, in attendance. After reviewing the financial and membership status, in which it was reported that four applications for membership had been approved by letter ballot, the Committee discussed plans for the publication of the 1942 Proceedings, and then devoted the remainder of the day to selecting the personnel of committees that are to report on subjects at the next annual meeting.

Bridge and Building Association

The Executive Committee of the Association met in Chicago on December 14, with the following in attendance: Vice Presidents N. D. Howard and J. L. Varker; Secretary L. Kindred; Treasurer F. E. Weise; Directors F. G. Campbell, J. S. Hancock, M. Meyer and L. C. Winkelhaus; and Past-Presidents A. E. Bechtelheimer, C. R. Knowles, T. N. Strate and Elmer T. Howson.

As its major item of business, the committee reviewed the names of members who volunteered for committee service and made tentative appointments to the committees to study and report on the subjects selected for consideration at the next annual meeting. It also gave consideration to a number of routine association matters, including plans for the publication of the 1942 Proceedings and the status of the membership. Five applicants were elected to membership.

Maintenance of Way Club of Chicago

One hundred and forty members and guests attended the meeting of the club in the Ambassador Room of Huyler's Restaurant in the Straus Building, Chicago, on December 21, when E. C. Vandenburgh, engineer maintenance of way, Chicago & North Western, spoke on Selecting the Essentials in Track Maintenance for 1943. Mr. Vandenburgh, referring to the greater intensity of rail traffic, with its greater wear and tear on the track structure, in the face of shortages in both materials and labor, stressed the importance of giving major attention in the year ahead to those factors in

(Continued on page 64)

Fairbanks-Morse No. 57 Railroad Motor Car equipped with Timken Bearings.

Keep your section cars rolling for Victory—mount them on Timken Bearings. This also will give you a decided advantage after Victory.

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Buy War Bonds. Conserve Rubber. Eliminate Unnecessary Travel. Use the Telephone Only When Important. Salvage All Scrap and Waste Material.

All Timken Bearing production now goes into fighting machines. However, the Timken Bearings in your motor vehicles or industrial machines will see you through the emergency—and beyond it—if you make sure they are lubricated and inspected regularly.

The most important requirement in railway section motor cars and trailers is *availability*—the quality of staying on the job; of always being ready for service.

Timken Tapered Roller Bearings, more than any other one feature, help to produce this quality through their ability to prevent friction and wear; to keep radial, thrust and combined loads under constant control; to maintain wheel gauge; to extend wheel and axle life; and to simplify lubrication.

Engineers who make Timken Bearings an indispensable feature of the section cars and other equipment they design are more valuable to their companies because they produce machines that *perform better* and *sell better*—for the trade-mark "TIMKEN" indicates superiority to equipment buyers everywhere.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

"All There Is In Bearings"

track maintenance that will have the most direct bearing upon the war effort of the country—the safe and expeditious movement of troops and materials of war.

The next meeting of the club, which will be held on January 25, will be addressed by G. R. Westcott, assistant engineer, Missouri Pacific, St. Louis, Mo., on Work Equipment in War-Time Days.

American Railway Engineering Association

The A. R. E. A. has cancelled plans for its annual meeting, scheduled to be held at Chicago on March 16-18. This action was taken at the meeting of the Board of Direction in Chicago on December 9, and was prompted by a desire to co-operate with the Office of Defense Transportation and the Association of American Railroads in reducing travel of railway officers to the minimum.

The reports of committees, the last of which are now nearing completion, already have been or will be mailed to members by the middle of February for their consideration. Written discussions will be invited, which, together with the reports, will be reviewed by the Board of Direction early in March, following which recommendations for revisions of or additions to the Manual will be submitted to letter ballot. The reports, discussions and decisions on letter ballots will then be published in the Proceedings for distribution to members, as in past years. This action suspending the March meeting, marks the first break in the continuity in the annual meetings of the association in the forty-two years since its organization.

At the same meeting of the Board of Direction on December 9, the terms of office of all present officers and directors were extended for one year, and W. H. Penfield, chief engineer, Chicago, Milwaukee, St. Paul & Pacific, and treasurer of the association, was elected a director, to fill the vacancy created in that office when A. A. Miller, chief engineer maintenance of way and structures, Missouri Pacific, was advanced to vice-president by the board on August 18, 1942, to fill the vacancy created by the death of W. F. Cummings, chief engineer, Boston & Maine. Mr. Penfield will continue as treasurer of the association.

Acting upon recommendations of the Board of Direction, appropriations by the Association of American Railroads for carrying on during 1943 the work of certain A. R. E. A. committees making special investigations or studies were authorized as follows: transverse fissure investigation, $6,000; rail investigations, $6,072; service tests of joint bars, $2,980; rolling load tests of joint bars, $3,000; cause of shelly spots and head checks, $7,000; investigation of web stresses, $5,000; study of engine burns, $1,000; investigation of stresses in tie plates, $2,500; bolt tension tests, $1,500; corrosion from brine drippings, $1,000; welding of manganese frogs, $1,000; impact investigation, $14,300; and fatigue tests of structural welds, $5,000. In addition, $30,000 was appropriated for carrying out the engineering division phases of work being undertaken by the joint committee of the mechanical and engineering divisions dealing with the relation between track and equipment. Of this latter amount, $5,000 is for continuation of studies of the relationship between wheel load and wheel diameter; $10,000 is for a continuation of the present locomotive counterbalance tests; $10,000 is for a continuation of studies of the relationship between rail gage and wheel contour; and $5,000 is for an investigation of flat spots. An additional appropriation to the amount of $12,190 for administrative and miscellaneous purposes, brings the total appropriation to $98,542. This compares with a total appropriation of $87,932 in 1942.

Supply Trade News

General

The Independent Pneumatic Tool Company has announced the removal of its Boston, Mass., office to 78 Brookline avenue.

The name of the **Scully Steel Products Company,** Chicago, subsidiary of the United States Steel Corporation, was changed to **United States Steel Supply Company** on January 1, to identify the supply company more closely with other subsidiaries.

Personal

Fred C. Davern has been appointed manager of railroad sales for the **Standard Oil Company of New Jersey.**

Cecil W. Guyatt, formerly assistant chief industrial engineer, has been named chief industrial engineer of the **American Steel & Wire Co. John S. Conant** has been made priorities administrator, at the same time continuing as general supervisor of production planning, and **Lloyd W. Hackley,** formerly supervisor of production planning in the cold rolled department at the Cuyahoga works in Cleveland, Ohio, has been appointed assistant general supervisor of production planning for the entire company.

William C. Carter, for 14 years vice-president, and for the last year executive vice-president, of the **Link-Belt Company** of Chicago, has been elected president, effective December 31, to succeed **Alfred Kauffmann,** who has resigned because of ill health. Mr. Kauffmann will continue as a member of the company's board of directors. Mr. Carter joined the Link-Belt, Pershing Road, Chicago, plant organization in 1902 as a draftsman, and subsequently held the positions of engineering department supervisor, construction superintendent, plant superintendent, general manager and vice-president in charge of production.

Obituary

David S. Youngholm, vice-president of the Westinghouse Electric & Manufacturing Co. in charge of the lamp division at Bloomfield, N. J., died recently.

Trade Publications

Floor Repairs.—The Flexrock Company, Philadelphia, Pa., has issued a four-page folder devoted to Ruggedwear Resurfacer, a floor patching material. The folder describes the advantages and applications of this material, and contains instructions, illustrated with photographs, of the approved manner for applying it.

Glass and Its Adaptability to Modern Needs.—A 30-page brochure with this title has been published by the Pittsburgh Plate Glass Company, Pittsburgh, Pa., to aid manufacturers to find substitutes for critical materials. The brochure explains the recommended uses of various types of glass, including polished plate glass, laminated safety glass, window glass, glass blocks, etc., and provides detailed data on the physical properties of each.

Du Pont Fumigation Manual.—E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del., has published a 76-page Fumigation Manual, a convenient reference book for the pest control operator. The manual discusses the problems of insect control in homes and industrial buildings, the types of insects that are prevalent, their habits and life cycle, and the methods and precautions that should be used to fumigate various types of buildings with hydrocyanic gas.

Transite Walls.—Johns-Manville, New York, has published a four-page folder, from TR-29A, entitled "Speed Up Plant Office Construction with Transite Walls," which explains the advantages of this type of construction for additional offices which must be built quickly or which may be of a temporary nature, from the standpoints of speed and ease of construction, non-use of critical materials, easy relocation and complete salvage. The folder is attractively printed in color and well illustrated with photographs.

Rail Cutting on the Track.—Bulletin 58-A, a 4-page folder entitled "Rail Cutting on the Track with Racine Portable Rail-Cutting Machines," has been published by the Racine Tool & Machine Co., Racine, Wis., describing its portable rail cutting machines. The folder is attractively printed in color and is illustrated with photographs showing the use of the machine in the field. Specifications are given, and the principle of cold sawing and the use of the saws for cropping and cutting rail in track are discussed.

Power Shovel and Dragline Parts.—The American Manganese Steel Division of the American Brake Shoe & Foundry Company, Chicago Heights, Ill., has published two bulletins, No. 641-D and No. 641-S, describing its power shovel dippers and dipper parts and other power shovel and dragline parts, respectively. The bulletins are profusely illustrated with photographs of the various types of equipment. Bulletin 641-D also explains the development of the Amsco renewable lip dipper and the X-ray method used for testing manganese steel castings.

Better Than An "A" Card

"Boss, I've been trying to figure out how I'm going to keep in touch with our railway friends this year," said the star salesman to his railway sales manager.

"What's the trouble, Bill?" replied the railway sales manager.

"It's a lot of troubles. In the first place we've got to see so many people if we do a complete job when selling the railroads, for we can never tell where an order may start."

"That's true."

"And these men are scattered all over the country—a lot of them in places that are hard to get to."

"You can't tell me anything about that. Don't forget that I spent twenty years on the road."

"I know that, Boss. That's why I'm talking to you. But this year we're facing new conditions."

"We face new conditions every year."

"That's true, but we've never had these problems. In the first place, it's harder to travel by train than for years. A lot of 'em have been taken off and the rest are so crowded that the roads are advertising to ask people to stay home."

"I've noticed that."

"And I can't use the buses, for they're worse than the trains."

"They always were."

"And I can't drive with an 'A' Card."

"What's your solution, then?"

"More advertising in *Railway Engineering and Maintenance*. Enough to keep *all* our products before our railway friends *every* month. It'll prevent them from forgetting any of our materials between my calls. And it'll help me get down to business with them a lot quicker when I am able to call on them, for they'll know what we make."

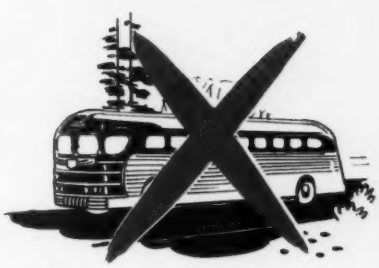
"Your thought is that we should use this magazine to *increase* the frequency of your calls, in a way?"

"That's it. These men all get that magazine—and they read it, too."

"I know they do, Bill. It's *their* magazine—deals with their problems. And that makes it a good magazine for us to use."

"That's what I think. You never see *that* magazine in the wrapper."

"Bill, you've got a good idea. Instead of *increasing* the interval between calls, we'll *reduce* it—through the use of *Railway Engineering and Maintenance*."



RAILWAY ENGINEERING AND MAINTENANCE IS READ BY MAINTENANCE OFFICERS OF ALL RANKS

"The Garand"..

OUR ARMY'S FAMED HIGH POWER RIFLE

Well built, accurate and exceptionally hard hitting! These are the outstanding and highly praised features of the Garand rifle. Used by both Army and Marine troops, these rifles have won great distinction on the field of action.

Hundreds of thousands of Garands have been made in an amazingly short period of time. But for the raw material producers and the factories—and for the men who built them, there had to be an abundance of water. To the Layne Organization fell the task of producing an amazingly high percentage of that water. The quality and dependability of Layne Wells and Pumps had long been proven on the field of action.

Layne Wells and Pumps are backed by more than sixty years of outstanding success in all parts of the world—and even under the most adverse conditions, they constantly maintained their enviable record of highest efficiency and long life. Layne's activity is now nearly 100 percent for the war effort, but when peace returns, installations for municipal and private industries will be resumed. In the meantime, every effort is being made to supply parts and repair service to all existing installations.

For late bulletins, catalogs and further information, address

LAYNE & BOWLER, INC.
Memphis, Tenn.

LAYNE
PUMPS & WELL WATER SYSTEMS

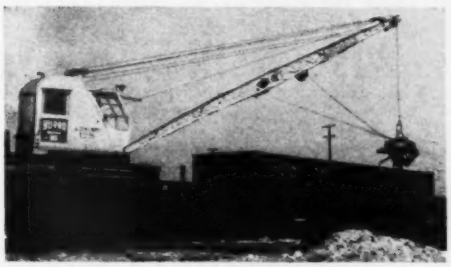
Affiliated Companies

Layne-Arkansas Company	Stuttgart, Ark.
Layne-Atlantic Company	Norfolk, Va.
Layne-Bowler New England Corp.	Boston, Mass.
Layne-Central Company	Memphis, Tenn.
Layne-Northern Company	Mishawaka, Ind.
Layne-Louisiana Company	Lake Charles, La.
Louisiana Well Company	Monroe, La.
Layne-New York Company	New York City.
Layne-Northwest Company	Milwaukee, Wis.
Layne-Ohio Company	Columbus, Ohio.
Layne-Texas Company	Houston, Texas.
Layne-Western Company	Kansas City, Mo.
Layne-Western Company of Minnesota	Minneapolis, Minn.
International Water Supply, Ltd.	London, Ontario, Can.

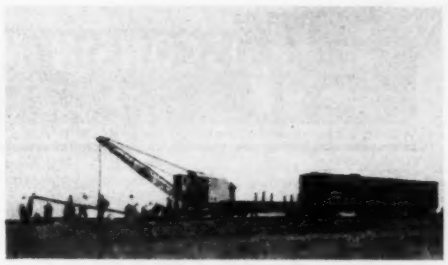
WORLD'S LARGEST WATER DEVELOPERS

Mounting Maintenance Problems call for **BURRO** speed

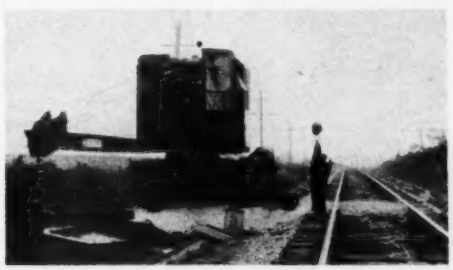
There's no time for leisurely maintenance work today. Tracks are being "pounded" as never before. Every maintenance job has become a speed job—for getting to the job (1), handling any situation (2), and keeping tracks clear (3), there are no cranes like BURRO CRANES.



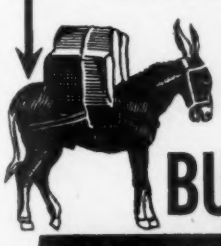
1 Low enough to travel on a flat car. Capable of traveling 20 m.p.h. under their own power.



2 7500 lb. draw bar pull—can carry own work, train and crew without a locomotive, can lay track, load, unload materials, level ballast, etc., etc.



3 Short tail swing permits 180° working radius without fouling adjacent track. Can lift self from track to set-off station, let train pass, and be back at work in a matter of minutes.



Write for Bulletins F-100 and F-110

BURRO CRANES

CULLEN-FRIESTEDT CO.,
1301 S. KILBOURN AVE. CHICAGO, ILLINOIS

Classified Advertisements

Use this section when seeking a new man, a new position, or when buying or selling secondhand equipment.

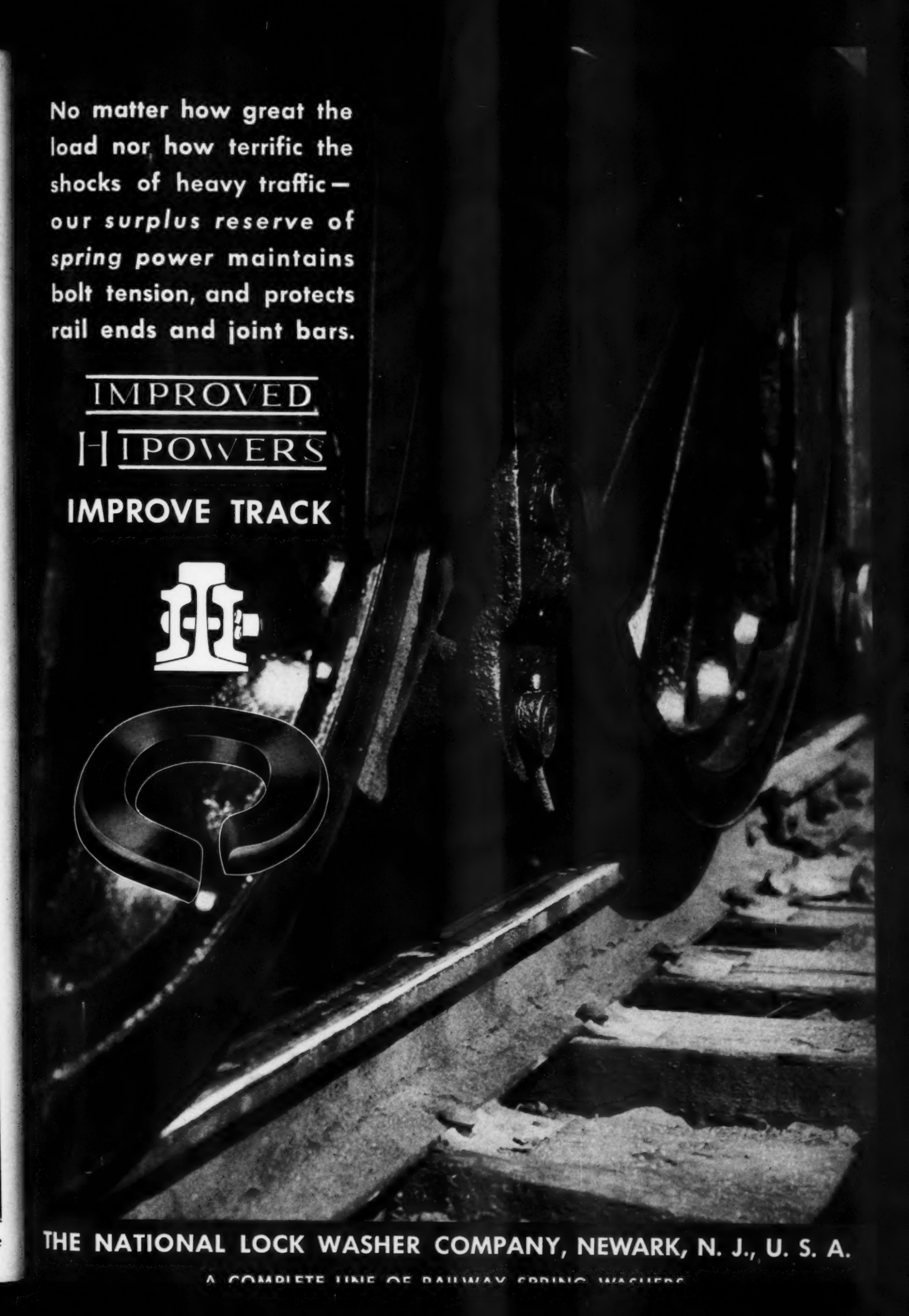
CLASSIFIED ADVERTISEMENTS, $10.00 an inch, one inch deep by three inches wide, an insertion.

EMPLOYMENT ADVERTISEMENTS, 10 cents a word a month, including address, minimum charge $2.00.

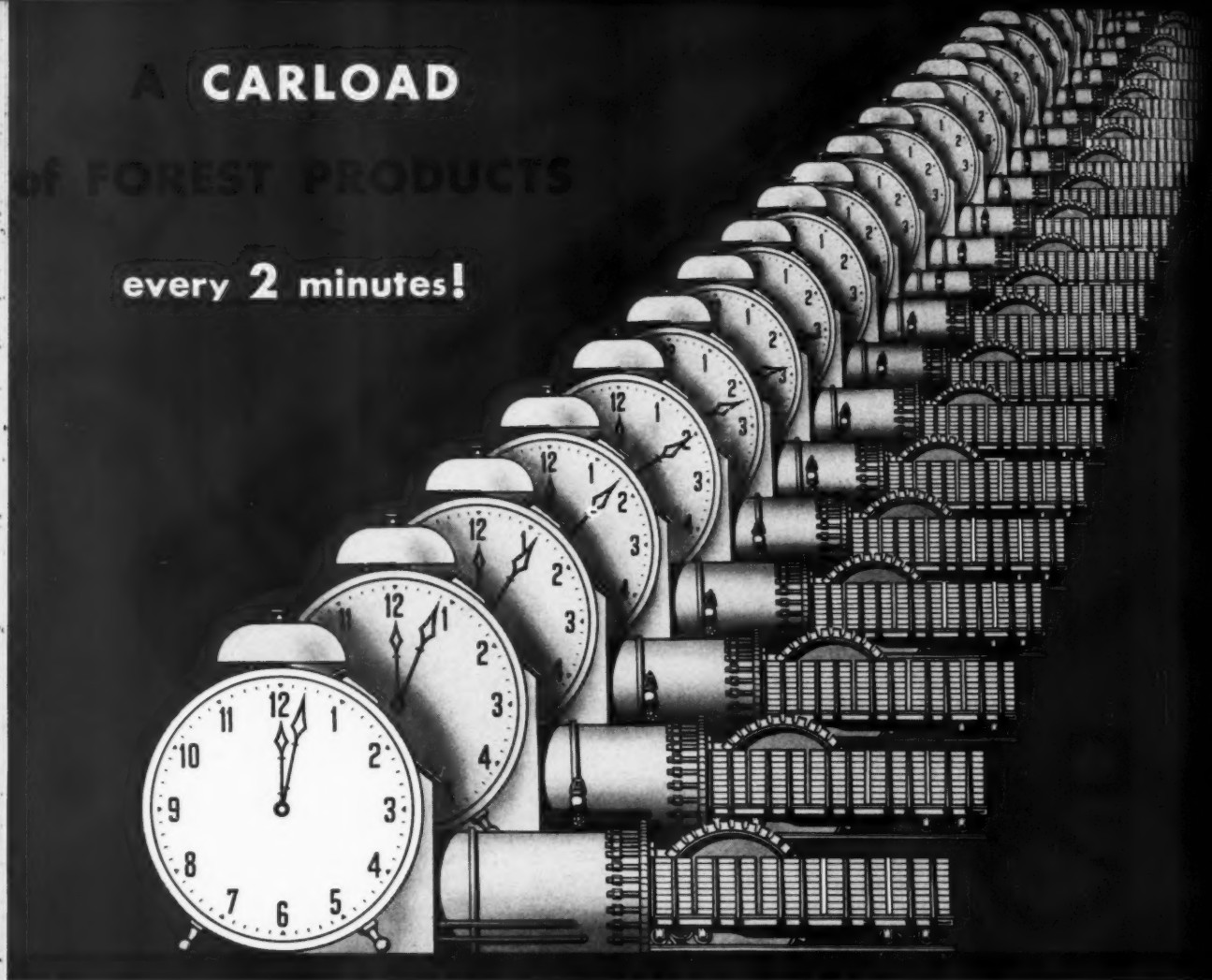
Remittance must accompany each order.

Railway Engineering and Maintenance
Classified Advertising Department
105 West Adams St., Chicago

ALPHABETICAL INDEX TO ADVERTISERS


No matter how great the load nor how terrific the shocks of heavy traffic— our *surplus reserve* of *spring power* maintains bolt tension, and protects rail ends and joint bars.
IMPROVED
HIPOWERS
IMPROVE TRACK
THE NATIONAL LOCK WASHER COMPANY, NEWARK, N. J., U. S. A.
A COMPLETE LINE OF RAILWAY SPRING WASHERS

A CARLOAD of FOREST PRODUCTS every 2 minutes!

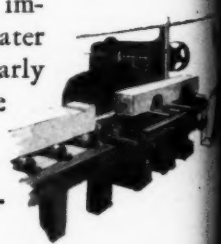


During accommodation hours last year, the railroads handled forest products to or from the Koppers Wood Preserving Division's treating plants at an average of a carload every two minutes!

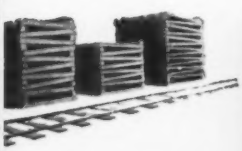
Without that excellent service and 100% cooperation, it would have been impossible to maintain the flow of pressure-treated wood which is playing such an important part in the war effort.

Full credit must go, also, to the men in the forests. Working hours there are necessarily from dawn to dusk. Yet rain or shine, woodsmen produced at rates that kept the treating plants on three shifts, seven days a week.

Every foot of pressure-treated wood helped some engineer to do some important job at lower cost, at greater speed, and with no worry about early repairs or replacements . . . the same advantages that made pressure-treated wood a versatile and widely recognized peacetime material.



What pressure-treated wood has done to help other engineers, it can do for you. If you have any construction problems where speed, economy and permanence are factors. It will pay you to investigate the use of pressure-treated wood. Ask for information.



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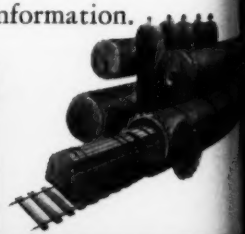
PITTSBURGH, PENNSYLVANIA



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